SYLLABUS

MASTER OF MECHANICAL ENGINEERING

DEPARTEMENT OF

MECHANICAL ENGINEERING

FACULTY OF INDUSTRIAL TECHNOLOGY AND SYSTEM ENGINEERING

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

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1. SILABUS DESAIN EKSPERIMEN / *SYLLABUS OF EXPERIMENTAL DESIGN*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**Desain Eksperimen** *Experimental Design*
	Kode MK *Course Code*	:	TM185103
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	I

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini merupakan mata kuliah yang memberi pengetahuan tentang konsep perancangan dan analisa suatu eksperimen untuk memperoleh hubungan antar variable eksperimen tersebut. Selain konsep perancangan dan analisa, mata kuliah ini juga memberikan pengetahuan tentang penerapannya dalam riset dan penelitian.

This course provides knowledge about the concept of designing and analyzing an experiment to obtain the relationship between the experimental variables. This course also provides knowledge about its application in research and investigation.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan menerapkan ilmu pengetahuan yang luas dan teknologi yang canggih di bidang teknik mesin.
(Able to apply extensive science and advanced technology in the field of mechanical engineering)

B. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
(Able to understand and utilize theory of engineering sciences in mechanical engineering)

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
(Able to analyse and solve engineering and technology problems)

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

- Mahasiswa mampu merancang dan menganalisa suatu eksperimen untuk mengetahui ada tidaknya hubungan antara suatu variable dengan variable yang lain baik single maupun multi variable
  Students are able to design and analyze an experiment to determine whether there is a relationship between a variable and other variables, both single and multi-variable
- Mahasiswa mampu menentukan hubungan antara suatu variable dengan variable yang lain
  Students are able to determine the relationship between a variable and another variable
- Mahasiswa mampu menerapkan metode perancangan dan analisa yang dipelajari untuk melakukan riset
  Students are able to apply the design and analysis methods to conduct research

POKOK BAHASAN
MAIN SUBJECT

- Uji hipotesis
  Hypothesis testing
- Analisa Varian (ANOVA)
  Analysis of Variance (ANOVA)
- Regresi
  Regression

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Blank, L., “Statistical Procedures for Engineering, Management, and Science”, McGraw- Hill, 1980
2. Bhattacharya, G.K., Johnson, R.A., “Statistical Concepts and Methods”, John Wiley, 1977
3. Montgomery, D.C., “Design and Analysis of Experiments”, John Wiley, 1991

PUSTAKA PENDUKUNG
ADDITIONAL REFERENCE

1. Kuehl, R. O., “Design of experiments : statistical principles of research design and analysis”, Pacific Grove: Duxbury, 2000

2. SILABUS MATEMATIKA REKAYASA LANJUT / *SYLLABUS OF ADVANCE ENGINEERING MATHEMATICS*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**MATEMATIKA REKAYASA LANJUT** *Advance Engineering Mathematics*
	Kode MK *Course Code*	:	TM185101
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	1

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini ditujukan untuk mahasiswa pascasarjana teknik mesin. Materi mata kuliah ini dipilih untuk memberikan dasar dasar matematika yang di perlukan pada matakuliah yang ditawarkan dalam kurikulum pascasarjana teknik mesin.

This course is intended for mechanical engineering graduate students. This course material was chosen to provide the basic mathematics needed in the courses offered in the postgraduate curriculum in mechanical engineering.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin. *Ability to understand and utilize the theory of engineering sciences in mechanical engineering.*
B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam. *Ability to assess theoretical concepts and methods of system design or mechanical engineering technology in depth.*
C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi. *Ability to analyze and solve engineering and technology problems.*

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

1. Mengetahui teori matematika rekayasa yang digunakan pada bidang rekayasa mekanika
   Know the engineering mathematical theories used in the field of mechanical engineering
2. Mampu menggunakan teori matematika rekayasa untuk menyelesaikan permasalahan rekayasa pada bidang rekayasa mekanika
   Able to use mathematical theory of engineering to solve engineering problems in the field of mechanical engineering

POKOK BAHASAN
MAIN SUBJECT

- Ordinary Differential Equations
- Linear Algebra & Vector Calculus
- Fourier Analysis & Partial Differential Equations

PRASYARAT
PREREQUISITES

-

PUSTAKA UTAMA
REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley & Sons, 2011
2. Glyn James, Advanced Modern Engineering Mathematics, 4th Edition, Prentice Hall, Pearson Education Limited, 2011
3. G. Strang. Linear Algebra and its Applications, Brooks Cole, 4th edition, 2005.
4. D. P. Bertsekas and J. N. Tsitsiklis. Introduction to Probability. Athena Scientific, 2002.

3. SILABUS METODE NUMERIK UNTUK REKAYASA MEKANIKA / *SYLLABUS OF NUMERICAL METHODS FOR MECHANICAL ENGINEERING*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	:	**METODE NUMERIK UNTUK REKAYASA MEKANIKA** ***Numerical Methods for Mechanical Engineering***
	Kode MK *Course Code*	:	TM185102
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	1

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini dirancang untuk mengenalkan metode numerik klasik dan modern yang tersedia untuk memecahkan masalah dalam bidang teknik. Pada saat yang sama, kursus ini bertujuan untuk membiasakan mahasiswa dengan komputer sebagai alat pemecahan masalah dan untuk meningkatkan kemampuan pemrograman dengan memanfaatkan bahasa pemrograman terstruktur.

This course is designed to introduce classical and modern numerical methods that are available to solve problems in engineering. At the same time, this course aims to familiarize students with computers as a problem solving tool and to improve programming skills by utilizing structured programming languages.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin. *Ability to understand and utilize the theory of engineering sciences in mechanical engineering.*
B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam. *Ability to assess theoretical concepts and methods of system design or mechanical engineering technology in depth.*
C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi. *Ability to analyze and solve engineering and technology problems.*

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu merumuskan masalah teknik dalam bentuk matematika yang sesuai dan memilih pendekatan numerik yang tepat.
  Able to formulate technical problems in the appropriate mathematical form and choose the right numerical approach.
- Mampu membuat program dan menggunakan algoritma penyelesaian numerik untuk kasus yang berkaitan dengan rekayasa mekanik
  Able to create programs and use numerical settlement algorithms for cases related to mechanical engineering

POKOK BAHASAN
MAIN SUBJECT

- Introduction
- Computer Programming Languages and Software
- Systems of Linear Algebraic Equations
- Matrix Eigenvalue Problems
- Polynomial Approximation and Interpolation
- Numerical Differentiation and Integration
- Ordinary Differential Equations

- Partial Differential Equations

PRASYARAT ***PREREQUISITES***

PUSTAKA UTAMA ***REFERENCES***
Masayuki Yano, James Douglass Penn, George Konidaris, and Anthony T. Patera. Math, Numerics, and Programming (for Mechanical Engineers). V1.2, September 2012.

4. SILABUS METODE PENELITIAN & KOMUNIKASI ILMIAH / *SYLLABUS OF RESEARCH METHODS AND SCIENTIFIC COMMUNICATION*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**: Metode Penelitian & Komunikasi Ilmiah** ***Research Methods and Scientific Communication***
	Kode MK *Course Code*	: TM185100
	Kredit / *Credits*	: 2 sks / 3.2 ECTS
	Semester	: 1

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberi pengetahuan mendasar yang diperlukan untuk melakukan penelitian ilmiah yang sesuai dengan bidang teknik dengan penekanan pada pemahaman konsep dasar penelitian dan metodologinya, memilih dan menentuk an masalah penelitian dan penulisan akademis.

Providing the fundamental knowledge needed to conduct scientific research in accordance with the engineering field with an emphasis on understanding basic research concepts and methodologies, selecting and determining research and academic writing problems.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan melaksanakan kajian ilmiah di bidang keilmuan dan teknologi teknik mesin di masyarakat dan industri dalam bentuk tesis dan makalah yang dipublikasikan dalam jurnal ilmiah internasional dan terakreditasi.
Ability to carry out scientific studies in the field of mechanical engineering science and technology in society and industry in the form of theses and papers published in accredited and scientific international journals.

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Ability to assess theoretical concepts and methods of system design or mechanical engineering technology in depth.

C. Kemampuan merumuskan ide-ide baru dari penelitian sebelumnya untuk perkembangan teknologi dan sistem mekanik.
Ability to formulate new ideas from the previous research for the development of technology and mechanical systems.

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

- Memahami beberapa konsep dasar penelitian dan metodologinya
  Understand some basic concepts of research and its methodologies
- Mampu mengidentifikasi topik penelitian yang tepat
  Able to identify appropriate research topics
- Dapat memilih dan mendefinisikan masalah dan parameter penelitian yang sesuai
  Able to select and define appropriate research problem and parameters
- Mampu menulis proposal penelitian (untuk melakukan proyek)
  Able to write research proposal (to undertake a project)
- Mampu mengatur dan melakukan penelitian (proyek lanjutan) dengan cara yang lebih tepat
  Able organize and conduct research (advanced project) in a more appropriate manner

POKOK BAHASAN
MAIN SUBJECT

- Tinjauan Penelitian dan Metodologinya
  Overview of Research and its Methodologies

- Memilih dan mendefinisikan masalah penelitian
  Selecting and defining a research problem
- Tinjauan Literatur
  Literature Review
- Desain penelitian
  Research design
- Penulisan Akademik
  Academic Writing

PUSTAKA UTAMA
REFERENCES

1. C. R. Kothari, Research Methodology: Methods & Techniques, New Age International Publishers, 2004.
2. Stephen Bailey, Academic Writing: A Handbook for International Students, Taylor & Francis Group, 2015
3. D. Evans et al., How to Write a Better Thesis, Springer International Publishing Switzerland, 2014.

5. SILABUS GETARAN MEKANIS / *SYLLABUS OF MECHANICAL VIBRATION*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**GETARAN MEKANIS** ***Mechanical Vibration***
	Kode MK *Course Code*	**:**	TM185206
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ditujukan untuk memberi pengetahuan dan memberi kemampuan untuk me-analisis getaran yang terjadi pada sistem mekanikal. Disamping itu, mata kuliah memberi pengetahuan tentang aspek praktis dari persoalan getaran

The course is intended to provide knowledge and provide the ability to analyze vibrations that occur in mechanical systems. In addition, the course provides knowledge about the practical aspects of the vibration problem

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu menganalisis getaran yang terjadi pada sistem mekanikal
  Able to analyze vibrations that occur in mechanical systems
- Mengerti tentang aspek praktis dari persoalan getaran
  Understand the practical aspects of vibration problems

POKOK BAHASAN
MAIN SUBJECT

- Phenomena, konsep dasar, pemodelan sistem.
  Phenomena, basic concepts, system modeling.
- Review tentang respon sistem 1 d.o.f. dan problem eigen-value, Matrik massa, redaman, kekakuan.
  Review of system response 1 d.o.f. and eigen-value problems, mass matrix, damping, stiffness.
- Analisis sistem 2 d.o.f. Analisis fundamental sistem m.d.o.f., termasuk sistem yang memuat rigid body motion.
  Analysis system 2 d.o.f. Fundamental analysis of the system m.d.o.f., including systems that contain rigid body motion.
- Ortogonalitas vektor mode getaran.

Orthogonality of vibration mode vector.

- Analisis respon sistem diskrit dengan metode normal-mode (modal analysis) dan dengan metode numerik.
  Analysis of discrete system responses by the normal-mode method (modal analysis) and by the numerical method.
- Analisis sistem kontinyu: penjabaran model matematikl dan penyelesaian analitis, penyelesaian dengan Metode Elemen Hingga.
  Continuous system analysis: translation of mathematical models and analytical solutions, solutions using the Finite Element Method.
- Getaran non-linier.
  Non-linear vibration.
- Pengendalian getaran.
  Vibration control.
- Analisis kondisi mesin : deskriptor getaran, variabel ukur dan alat ukur, waveform & frequency domain, FFT, diagnosis sinyal getaran.
  Machine condition analysis: vibration descriptors, measuring variables and measuring devices, waveform & frequency domain, FFT, vibration signal diagnosis.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Rao, Singiresu S. , Mechanical Vibrations, SI edition, Prentice-Hall, Singapore, 2005
2. Inman, Deniel J. , Engineering Vibrations, 2nd edition, Prentice-Hall Intl. Upper Saddle River, NJ, 2001
3. Meirovitch, Leonard, Fundamental of Vibrations, McGraw-Hill International Co., Singapore, 2001

6. SILABUS DINAMIKA MESIN PERKAKAS / *SYLLABUS OF DYNAMICS OF MACHINE TOOLS*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**DINAMIKA MESIN PERKAKAS** *Dynamics of Machine Tools*
	Kode MK *Course Code*	:	TM185209
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2/3

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mempelajari getaran akibat proses pemesinan yang tidak stabil pada mesin perkakas (Chatter) dan efeknya pada kekasaran permukaan serta merencanakan kondisi pemotongan agar proses stabil. Pemodelan sistem getaran mesin perkakas menjadi model matematis yang lebih sederhana, sehingga dapat disimulasikan secara numeric guna modifikasi dengan tujuan meningkatkan batas stabilitasnya. Pengaruh kekakuan dinamik dan parameter kondisi pemotongan terhadap chatter serta pengaruhnya pada gelombang permukaan produk. Cara-cara mengeliminir chatter baik pasif maupun aktif.

Study the vibrations caused by the unstable machining process on a tool machine (Chatter) and their effect on surface roughness and plan cutting conditions so that the process is stable. The modeling of machine tool vibration systems becomes a simpler mathematical model, so that it can be numerically simulated for modification with the aim of increasing its stability limit. Effect of dynamic stiffness and cutting condition parameters on the chatter and its effect on the product surface wave. Ways to eliminate chatter both passive and active.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu memahami prinsip proses terjadinya chatter pada mesin perkakas dan mengindentifikasinya.
Able to understand the principle of the process of the occurrence of chatter on machine tools and identify it.
- Mampu memodelkan sistem getaran mesin perkakas dan mensimulasikan secara numerik untuk memodifikasi struktur dan/atau sistem redaman sehingga batas stabilitas dapat ditingkatkan.
Able to model machine vibration system and simulate numerically to modify the structure and / or damping system so that the stability limit can be increased.

- Mahasiswa mampu melakukan praktikum pengukuran getaran saat proses pemesinan dan menganalisis hasilnya kapan terjadi chatter.
  Students are able to do a vibration measurement practicum during the machining process and analyze the results when a chatter occurs.
- Mampu mengetahui faktor-faktor yang berpengaruh pada terjadinya chatter.
  Being able to know the factors that influence the occurrence of chatter.
- Mempunyai kemampuan bertanya, dapat memberi komentar, menjawab pertanyaan dan kerjasama.
  Have the ability to ask questions, can give comments, answer questions and cooperate.

POKOK BAHASAN
MAIN SUBJECT

- Prinsip sistem getaran SDOF, TDOF dan MDOF dan pemodelannya.
  Principles of SDOF, TDOF and MDOF vibration systems and their modeling.
- Analisis modal: modal parameter seperti frekuensi pribadi, rasio redaman, bentuk modus getar.
  Capital analysis: modal parameters such as personal frequency, attenuation ratios, vibrate mode forms.
- Pemrograman untuk solusi MDOF, plot grafik fungsi transfer, Fast Fourier Transform dll.
  Programming for MDOF solutions, plot graphs of transfer functions, Fast Fourier Transform, and others.
- Penentuan batas stabilitas (chatter) proses pemesinan, polar diagram untuk proses bubut dan milling.
  Determination of stability limits (chatter) machining process, polar diagrams for the lathe and milling.
- Faktor-faktor yang berpengaruh pada terjadinya chatter.
  Factors that influence the occurrence of chatter.
- Praktikum proses pengukuran getaran pada mesin perkakas, pengolahan data dan analisis.
  Practicum of vibration measurement process on machine tools, data processing and analysis.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCE

1. Suhardjono, Ein Variabel einsetzbarer gedämpfter Tilger zur Reduzierung von Ratterschwingungen bei Drehmaschinen, W&T verlag, Berlin 2000.
2. Stone, B., Chatter and Machine Tools, Springer Int. Publishing Switzerland, 2014.
3. Koenigsberger, and J. Tlusty, Machine Tools Structures, Pergamon press, 1970.
4. Zaveri, K., Modal Analysis of Large Structures - Multiple Exciter Systems, Brüel & Kjaer, 1984.
5. Weck, M. Werkzeug Machinen Handbuch vol. IV, Springer Verlag, Berlin, 1998.

7. SILABUS DESAIN PRODUK / *SYLLABUS OF PRODUCT DESIGN*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**DESAIN PRODUK** ***Product Design***
	Kode MK *Course Code*	:	TM185208
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang metode perancangan produk terintegrasi berdasarkan aspek kualitas, biaya produksi, dan waktu pembuatan.

Provide knowledge about integrated product design methods based on aspects of quality, production costs, and manufacturing time.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan menerapkan ilmu pengetahuan yang luas dan teknologi yang canggih di bidang teknik mesin.
Ability to apply extensive science and advanced technology in the field of mechanical engineering.

B. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Ability to analyze and solve engineering and technology problems.

C. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Ability to develop an innovative design mechanical system and its components by utilizing interdisciplinary or multidisciplinary scientific fields.

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu merancang produk yang memenuhi persyaratan teknik (kualitas)
  Able to design products that meet engineering (quality) requirements
- Mampu merancang produk dengan biaya dan waktu yang optimal
  Able to design products with optimal cost and time
- Mampu mengevaluasi perancangan dan pengembangan produk
  Able to evaluate product design and development

POKOK BAHASAN
MAIN SUBJECT

- Proses desain,desain produk, dan metode pengembangan
  Design process, product design, and development method
- Perancangan Untuk Manufaktur (DFM)
  Design for Manufacturing (DFM)
- Perancangan Untuk Perakitan (DFA)
  Design for assembly (DFA)
- Desain untuk Lingkungan (DFE)
  Design for the Environment (DFE)
- Quality Function Deployment (QFD)
  Quality Function Deployment (QFD)

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCE

1. Bralla, James G., Design for Manufacturability Handbook. Mc Graw-Hill, International Edition, 2003.
2. Boothroyd, Geoffrey., Dewhurst, Peter and Knight, Winston, Product Design For Manufacture and Assembly. Second edition. Marcel Dekker, Inc. USA, 2002.
3. Cohen, J. Lao., Handbook of Quality of Function Deployment, Method and Practical Approach., 2003.
4. Urlich, Karl T., Eppinger, Steven D., Product Design and Development. Mc Graw-Hill, Inc., 2001.
5 Wood, Kristin L., Kevin N. Otto L, Product Design – Techniques in Reverse Engineering and New Product Development, Prentice Hall, Inc, 2001

8. SILABUS METODE ELEMEN HINGGA / *SYLLABUS OF FINITE ELEMENT METHODS*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**METODE ELEMEN HINGGA** ***Finite Element Methods***
	Kode MK *Course Code*	:	TM185221
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2/3

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ditujukan untuk memberi pengetahuan dasar tentang teori Metode Elemen Hingga. Disamping itu, mata kuliah memberi kemampuan dasar penggunaan perangkat lunak berbasis metode elemen hingga..

The course is intended to provide basic knowledge of the Finite Element Method theory. In addition, courses provide the basic ability to use software based on the finite element method.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa memahami tentang konsep diskritisasi, spesifikasi mesh, jenis elemen serta sistem koordinat
  Students understand about the concept of discretization, mesh specifications, types of elements and coordinate systems
- Mahasiswa mampu menjabarkan prinsip energi potensial minimum pada elemen planar, elemen isoparametrik, maupun elemen ber-ordo tinggi
  Students are able to describe the principle of minimum potential energy in planar elements, isoparametric elements, as well as high order elements
- Mahasiswa mampu menggunakan perangkat lunak untuk memodelkan dan menganalisa hasil yang diperoleh
  Students are able to use software to model and analyze the results obtained

POKOK BAHASAN
MAIN SUBJECT

Teori dasar elastisitas benda padat, hubungan perpindahan-regangan-tegangan, interpolasi Lagrange dan integrasi numerik. Konsep diskritisasi dan spesifikasi mesh. Jenis elemen dan sistem koordinat. Prinsip enersi potensial minimum. Elemen segitiga dan elemen segiempat untuk problem tegangan planar dan regangan planar. Elemen isoparametrik, elemen ordo tinggi. Elemen simetri aksial, elemen pejal. Penjabaran Metoda Elemen

Hingga sebagai teknik penyelesaian untuk problem medan (di luar mekanika benda padat) : variational approach, penurunan dan penyelesaian model matematis untuk problem medan

The basic theory of solid body elasticity, stress-strain-transfer relations, Lagrange interpolation and numerical integration. The concept of discretization and mesh specifications. Element type and coordinate system. The principle of minimum potential energy. Triangle elements and quadrilateral for planar stress and planar strain problems. Isoparametric element, high order element. Axial symmetry elements, solid elements. Interpretation of Finite Element Method as a settlement technique for field problems (outside of solid body mechanics): variational approach, mathematical model settlement and settlement for field problems

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Zienkiewicz, O.C., and R.L. Taylor, The Finite Element Method, 4th ed., vol. 2, McGraw-Hill Book Co. (UK), London, 1989
2. Desai, Chandrakant S., and T. Kundu, Introductory Finite Element Method, CRC Press, Boca Raton, Fla., 2001
3. Mottram, J.T., and C.T. Shaw, Using Finite Elements in Mechanical Design, McGraw-Hill Book Co. (UK), London, 1996

9. SILABUS OPTIMASI DESAIN / *SYLLABUS OF DESIGN OPTIMIZATION*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**OPTIMASI DESAIN** ***Design Optimization***
	Kode MK *Course Code*	**:**	TM185218
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberi pengetahuan dan kemampuan untuk merumuskan permasalah disain struktur menjadi persamaan optimasi dan menyelesaiannya dengan metode yang tepat.

Give knowledge and ability to formulate structural design problems into optimization equations and solve them with appropriate methods.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu merumuskan problem disain struktur menjadi persamaan optimasi
Students are able to formulate structural design problems into optimization equations
- Mahasiswa mampu menyelesaian persamaan optimasi linear dan non linear secara analitis
Students are able to solve analytical linear and non linear equations analytically
- Mahasiswa menguasai metode-metode penyelesaian optimasi linear dan non linear secara numerik
Students master the methods of solving linear and non-linear optimization numerically
- Mahasiswa menguasai penggunaan software optimasi
Students master the use of optimization software

POKOK BAHASAN
MAIN SUBJECT

- Konsep optimasi
Optimization concept
- Perumusan permasalahan optimasi
Formulation of optimization problems
- Penyelesaian permasalahan optimasi tanpa constraint secara analitis dan numerik
Solving optimization problems without constraints analytically and numerically

- Penyelesain permasalahan optimasi dengan constraint secara analitis dan numerik
  Solving optimization problems with analytical and numerical constraints

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Arora, Jasbir S., Introduction to Optimum Design, 4 nd Edition, Elsevier Academic Press, 2017
2. Singiresu S. Rao, Engineering Optimization, Theory and Practice , John Wiley & Sons Inc, 2009

PUSTAKA PENDUKUNG
SUPPORTING REFERENCES

10. SILABUS PEMODELAN SISTEM DINAMIS / *SYLLABUS OF DYNAMICS SYSTEM MODELING*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**PEMODELAN SISTEM DINAMIS** ***Dynamics System Modeling***
	Kode MK *Course Code*	**:**	TM185217
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberi pengetahuan dan kemampuan untuk memodelkan sistem dinamis serta menggunakan software simulasi untuk mendapatkan dan menganalisa hasil yang diperoleh.

Give knowledge and ability to model dynamic systems and use simulation software to obtain and analyze the results obtained.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu memodelkan sistem dinamis, baik sistem diskrit maupun sistem kontinyu
Students are able to model dynamic systems, both discrete and continuous systems
- Mahasiswa mampu mendapatkan response sistem dinamis yang sederhana secara analitis.
Students are able to get an analytical simple dynamic system response.
- Mahasiswa mampu menggunakan software simulasi dan menganalisa hasil yang didapatkan.
Students are able to use simulation software and analyze the results obtained.

POKOK BAHASAN
MAIN SUBJECT

Pengenalan system, pemodelan, simulasi kontinyu dan diskrit, distribusi, validation experiment, experiment and simulation, system modeling (complexe system). Software simulation.

System introduction, modeling, continuous and discrete simulation, distribution, validation experiment, experiment and simulation, system modeling (complex system). Simulation software.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Law, A.M. Kelton W.D., Simulation Modeling dan Analysis, Mc Graw Hill,2rd edition,1991.
2. Robert, N; Anderson, R. Deal, Introduction Computer Simulation, Addison Wisley,1983.
3. Askin,R.G, Modeling and analysis of manufacturing systems, John Wiley, 1993.

PUSTAKA PENDUKUNG
SUPPORTING REFERENCES

11. SILABUS REKAYASA KUALITAS / *SYLLABUS OF ENGINEERING QUALITY*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**REKAYASA KUALITAS** ***Engineering Quality***
	Kode MK *Course Code*	:	TM185222
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini membahas tentang teknik-teknik yang efektif untuk meningkatkan kualitas dari produk di industri manufaktur. Teknik tersebut merupakan teknik optimasi seperti Response Methodology (RSM), PCR, TOPSIS, metoda Taguchi secara tunggal ataupun digabungkan dengan grey relational analysis (ERA), Fuzzy Logic dan Grey Fuzzy Logic

This course discusses effective techniques for improving the quality of products in the manufacturing industry. The technique is an optimization technique such as Response Methodology (RSM), PCR, TOPSIS, Taguchi method individually or combined with gray relational analysis (ERA), Fuzzy Logic and Gray Fuzzy Logic

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu menerapkan pembuatan peta kendali atribut dan variabel
  Being able to apply attribute and variable control mapping
- Mampu melakukan analisis kemampuan proses
  Able to do process capability analysis
- Mampu melakukan optimasi satu respon dengan menggunakan metode response surface dan inverse matrix
  Able to optimize one response by using the response surface and inverse matrix methods
- Mampu melakukan optimasi satu dan multi respon dengan menggunakan response surface methodology dan desirability function
  Able to optimize one and multiple responses using response surface methodology and desirability function
- Mampu melakukan optimasi respon tunggal dengan menggunakan metode Taguchi
  Being able to optimize a single response by using the Taguchi method
- Mampu melakukan optimasi multi respon dengan menggunakan gabungan process capability ratio (PCR)-technique for order preference by similarity to ideal solution (TOPSIS), Taguchi-grey relational analysis, Taguchi-fuzzy dan Taguchi grey fuzzy
  Able to perform multi-response optimization using a combined process capability ratio (PCR) -technique for order preference by similarity to ideal solution (TOPSIS), Taguchi-gray relational analysis, Taguchi-fuzzy and Taguchi gray fuzzy

POKOK BAHASAN
MAIN SUBJECT

- Pengertian tentang kualitas, critical to quality characteristics (CTQs), spesifikasi dan variansi
  Understanding of quality, critical to quality characteristics (CTQs), specifications and variance

- Peta kendali atribut dan variabel
  Map of attribute and variable control
- Analisis kemampuan proses dan indeks-indeks Cp dan Cpk
  Analysis of process capability and Cp and Cpk indices
- Optimasi satu respon dengan menggunakan response surface methodology dan inverse matrix
  Optimization of one response using response surface methodology and inverse matrix
- Optimasi satu dan multi respon dengan menggunakan response surface methodology dan desirability function
  One and multi-response optimization using response surface methodology and desirability function
- Optimasi satu respon dengan menggunakan metode Taguchi
  One response optimization using the Taguchi method
- Optimasi multi respon dengan menggunakan process capability ratio (PCR)-technique for order preference by similarity to ideal solution (TOPSIS), Taguchi-grey relational analysis, Taguchi-fuzzy, Taguchi-grey-fuzzy
  Multi-response optimization by using process capability ratio (PCR) -technique for order preference by similarity to ideal solution (TOPSIS), Taguchi-gray relational analysis, Taguchi-fuzzy, Taguchi-gray-fuzzy

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Blank, L., Statistical Procedures for Engineering, Management, and Science, McGraw-Hill, 1985
2. Ross, P. J., Taguchi Techniques for Quality Engineering, McGraw-Hill, 2008
3. Chase, R. B., Jacobs, F. R. dan Aquilano, N. J., Operations Management for Competitive Advatages, 11th Ed, McGraw-Hill, 2006

PUSTAKA PENDUKUNG
SUPPORTING REFERENCES

1. Belavendram, N., Quality by Design: Taguchi Techniques for Industrial Experimentation, Prentice Hall, 1995
2. Montgomery, D. C., Design and Analysis of Experiments, 7th Ed, Wiley , 2009
3. Myers, R. H. dan Montgomery, D. C., Response surface methodology: Process and Product Optimization Using Design Experiments, 2nd edition, Wiley, 2002
4. Park, S. H., Robust Design and Analysis for Quality Engineering, Chapman & Hall, 1996
5. Besterfield, D. H., Quality Control, Prentice Hall, 2008

12. SILABUS SISTEM PENGENDALIAN LINEAR / *SYLLABUS OF LINEAR SYSTEM CONTROL*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**Sistem Pengendalian Linear** *Linear System Control*
	Kode MK *Course Code*	:	TM185225
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini merupakan pengantar desain sistem kontrol linier modern. Mahasiswa akan belajar bagaimana memodelkan sistem dinamika dalam model matematika ruang-keadaan (state-space), Karakteristik struktural: stabilitas, controllability, observability, bentuk kanonik, dan realisasi minimal. Desain pengontrol state-sapce dengan metode pole placement dan linear quadratic regulator.

This course is an introduction to modern linear control system design. Students will learn how to model dynamics systems in the state-space mathematical model, Structural characteristics: stability, controllability, observability, canonic forms, and minimal realization. State-space controller design by pole placement method and linear quadratic regulator.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu memodelkan sistem dinamika dalam rekayasa mekanika dalam bentuk state-space.
Students are able to model the dynamics system in mechanical engineering in the form of state-space.
- Mahasiswa mampu menganalisa stabilitas, controllability, observability dan realization dari model state-space.
Students are able to analyze stability, controllability, observability, and realization of the state-space model.
- Mahasiswa mampu mendesain sistem kendali dengan metode pole placement, linear quadratic regulator.
Students are able to design control systems using the pole placement method, linear quadratic regulator

POKOK BAHASAN
MAIN SUBJECT

- Konsep dasar sistem kendali dan aplikasi teori pengendalian
Basic concepts of control systems and the application of control theory

- Pemodelan sistem dinamis dalam bentuk state-space, realisasi dan solusi untuk model state-space
  Dynamic system modeling in the form of state-space, realizations and solutions for state-space models
- Analisa stabilitas, Controllability dan Observability
  Stability analysis, controllability and observability
- State-feedback dan state- estimator
  State-feedback and state-estimator
- Pengenalan sistem kendali optimal
  Introduction of the optimal control system

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
REFERENCES

1. Robert L. Williams II and Dpuglas A. Lawrence, Linear State-Space Control Systems, John Wiley & Sons, 2007.
2. E. Hendricks, O. Jannerup and P. H. Sorensen, Linear System Control: Deterministic and Stochastic Methods, Springer, 2008.
3. Joao P. Hespanha, Linear System Theory, Princenton University Press, 2009.
4. Chi-Tsong Chen, Linear System Theory and Design, Oxford University Press, 1999.

PUSTAKA PENDUKUNG
SUPPORTING REFERENCES

13. SILABUS TEORI PENGENDALIAN MODERN / *SYLLABUS OF MODERN CONTROL THEORY*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**TEORI PENGENDALIAN MODERN** ***Modern Control Theory***
	Kode MK *Course Code*	**:**	TM185219
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Mata kuliah ini memberikan dasar-dasar teori pengendalian modern dengan penggunaan model state-space. Cakupan pembahasan dari mata-kuliah ini adalah pemodelan, analisis dan perancangan sistem kendali. Pembahasan analisis meliputi, stabilitas, controllability, observability dan realization dari model state-space. Sedangkan metode perancangan sistem kendali meliputi, pole placement, linear quadratic regulator, Kalman filter and linear quadratic Gaussian.

This course provides the basics of modern control theory with the use of state-space models. The scope of discussion of this course is modeling, analysis and control system design. The analysis discussion covers, stability, controllability, observability and realization of the state-space model. While the control system design methods include, pole placement, linear quadratic regulator, Kalman filter and linear quadratic Gaussian.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOME

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu memodelkan sistem dinamika dalam rekayasa mekanika dalam bentuk state-space
Students are able to model system dynamics in mechanical engineering in the form of state-space
- Mahasiswa mampu menganalisa stabilitas, controllability, observability dan realization dari model state-space.
Students are able to analyze the stability, controllability, observability and realization of the state-space model.
- Mahasiswa mamapu mendesain sistem kendali dengan metode pole placement, linear quadratic regulator, linear quadratic Gaussian.
Students are able to design a control system using the pole placement method, linear quadratic regulator, linear quadratic Gaussian.

POKOK BAHASAN

MAIN SUBJECT
- Pengantar pengendalian modern *Introduction to modern control* - Matematika untuk pengendalian modern *Mathematics for modern control* - Controllability dan observability - Canonical decomposition - Realization dan mininimal realization - Stabilitas *Stability* - Pengendalian state-feedback, pole placement, linear quadratic regulator, Kalman filter and linear quadratic Gaussian. *State-feedback control, pole placement, linear quadratic regulator, Kalman filter and linear quadratic Gaussian.*
PRASYARAT ***PREREQUISITES***
PUSTAKA UTAMA ***REFERENCES***
- Robert L. Williams II and Dpuglas A. Lawrence, Linear State-Space Control Systems, John Wiley & Sons, 2007. - E. Hendricks, O. Jannerup and P. H. Sorensen, Linear System Control: Deterministic and Stochastic Methods, Springer,2008
PUSTAKA PENDUKUNG ***SUPPORTING REFERENCES***

14. SILABUS DINAMIKA KENDARAAN / *SYLLABUS OF VEHICLE DYNAMICS*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	:	**DINAMIKA KENDARAAN** ***Vehicle Dynamics***
	Kode MK *Course Code*	:	**TM184750**
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2/3

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberi pengetahuan dan kemampuan merancang konstruksi kendaraan dan menganalisa kestabilan kendaraan tersebut

Provide knowledge and ability to design vehicle construction and analyze the stability of the vehicle

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu mendisain sistem penggerak, sistem suspensi, sistem kemudi dan sistem pengereman.
  Students are able to design the drive system, suspension system, steering system and braking system.
- Mahasiswa mampu menganalisa kestabilan suatu kendaraan
  Students are able to analyze the stability of a vehicle

POKOK BAHASAN
MAIN SUBJECT

- Konsep Desain, konstruksi kendaraan dan perkembangan teknologi kendaraan
  Design concepts, vehicle construction and vehicle technology development
- Stabilitas Kendaraan
  Vehicle Stability
- Pengaruh Karakteristik ban thd stabilitas Kendaraan
  Effect of tire characteristics on vehicle stability
- Disain sistem penggerak
  Drive system design
- Desain Sistem Suspensi, Sistem Kemudi, Sistem pengereman
  Suspension System Design, Steering System, Braking System

PRASYARAT

PREREQUISITES
PUSTAKA UTAMA ***REFERENCES***
1. Sutantra, “Teknologi Otomotif, Teori dan Aplikasinya, Guna Widya, Surabaya, 2001 2. Wong, “Theory of Ground Vehicles”, John Wiley. 3. Kamal & Wolf, “Modern Automotive Structural Analysis”, Von Nostraud Reinhold Company 4. Hucho,” Aerodynamics for Automotive”, John Willey.

15. SILABUS ALIRAN FLUIDA VISCOUS / *SYLLABUS OF VISCOUS FLOW*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**ALIRAN FLUIDA VISCOUS** ***Viscous Flow***
	Kode MK *Course Code*	**:**	**TM185212**
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Kuliah ini dimaksudkan untuk memberikan pengetahuan dasar aliran fluida viskos (kental). Selain itu juga memberikan analisis fisik dan matematik yang mendasari aliran fluida kental, termasuk beberapa peneraapannya di dalam bidang keteknikan.

This lecture is intended to provide basic knowledge of viscous fluid flow. It also provides physical and mathematical analysis that underlies the flow of viscous fluid, including some of its applications in the engineering.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

- Mampu menjelaskan konsep dasar mekanika kontinuum, persamaan konservasi, dan konsep lapisan batas
  Able to explain the basic concepts of Continuum mechanics, conservation equations, and boundary layer concepts
- Mampu menganalisis persamaan fluida Newton dan persamaan Navier-Stokes.
  Able to analyze Newton's fluid equations and Navier-Stokes equations.
- Mampu mengidentifikasi perbedaan antara vorteks dan vortisitas
  Being able to identify the difference between vortices and vortices
- Mampu mengevaluasi persamaan Navier-Stokes dan persamaan aliran lapisan batas
  Able to evaluate the Navier-Stokes equation and the boundary layer flow equation

POKOK BAHASAN
MAIN SUBJECT

- Mekanika kontinum
  Continuum Mechanics
- Persamaan konservasi dasar
  Basic conservation equations
- Persamaan fluida Newton dan persamaan Navier-Stokes

Newtonian fluid equation and the Navier-Stokes equation

- Penyelesaian terhadap persamaan Navier-Stokes
  Solution to the Navier-Stokes equation
- Dinamika vortisitas
  The dynamics of vorticity
- Lapisan batas (Boundary layer)
  Boundary layer Flows
- Pengenalan aliran turbulen
  Introduction to turbulent flow

PRASYARAT
PREREQUISITES

Termodinamia I, Mekanika Fluida Dasar I dan II, Termodinamika

PUSTAKA UTAMA
REFERENCES

1. White, F. M., Viscous Fluid Flow, 3rd edition, McGraw-Hill, 2006 (Main)
2. Tennekes, H. and Lumley, J. L., "A First Course in Turbulence", The MIT Press, 1972 (complementary)
3. Panton, R. L., Incompressible Flow, 4th edition, John Wiley & Sons, New York, 2013 (complementary)

PUSTAKA PENDUKUNG
SUPPORTING REFERENCES

16. SILABUS MEKANIKA MATERIAL LANJUT / *SYLLABUS OF ADVANCED MECHANICS OF MATERIALS*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**:**	**Mekanika Material Lanjut** ***Advanced Mechanics of Materials***
	Kode MK *Course Code*	**:**	TM185205
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Meningkatkan pengetahuan untuk memahami dan memanfaatkan konsep-konsep kekuatan material pada rancang bangun dan rekayasa.

Increase knowledge to understand and utilize the concepts of material strength in design and engineering.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering
B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth
C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems
D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

1. Mampu melakukan analisa kondisi beban tegangan-regangan pada suatu struktur/konstruksi
Able to analyze stress-strain load conditions in a structure / construction
2 Mampu melakukan analisa kegagalan suatu struktur/ konstruksi
Being able to analyze the failure of a structure / construction

POKOK BAHASAN
MAIN SUBJECT

- Konsep-konsep perancangan berbasis kekuatan material
Design concepts based on material strength
- Sifat-sifat mekanik material untuk perancangan
Material mechanical properties for design
- Analisa beban, Tegangan-Regangan Statik Multi Dimensi
Load analysis, Multi-dimensional Static Stress Strain
- Analisa Kegagalan Pembebanan Statik
Static Load Failure Analysis
- Konsep Tegangan Sisa
The concept of Residual Voltage
- Analisa Tegangan-Regangan Silinder Dinding Tipis, Dinding Tebal dan Silinder Berlapis
Stress-Strain Analysis of Thin Wall Cylinders, Thick Walls and Layered Cylinders

- Beban Kejut dan Beban Dinamik
  Shock Loads and Dynamic Loads
- Sifat-sifat Mekanik Fatigue material untuk Perancangan
  Mechanical properties of material fatigue for design
- Analisa Beban Tegangan Dinamik Multi Dimensi
  Multi-dimensional dynamic voltage load analysis
- Analisa Kegagalan Pembebanan Dinamik Fatigue
  Analysis of Fatigue Dynamic Failure Analysis
- Tegangan Kontak.
  Contact Voltage

PUSTAKA UTAMA
MAIN REFERENCE

1. Robert C. Juvinal, Engineering Consideration of Stress, Strain and Strength, Mc Graw-Hill, New York, 1967
2. Joseph H. Faupel, Franklin E. Fisher, Engineering Design, A Synthesis and Material Engineering, A Wiley Interscience, John Wiley & Sons, New York , 1981
3. J. A. Collin, Failures of Mechanical Design, A Wiley Interscience, John Wiley & Sons, New York, 1981
4. Arthur P. Boresi, Omar M Sidebottom, Advanced Mechanics of Materials, John Wiley & Sons, New York, 1985
5. Weaver & Gere, Analisa Matriks untuk Struktur Rangka, Penerbit Erlangga, Jakarta
6. James W. Dally , William F. Riley, Experimental Stress Analysis, Mc Graw-Hill, New York, 1991

17. SILABUS MEKANIKA KOMPOSIT / *SYLLABUS OF MECHANICS OF COMPOSITE*

MATA KULIAH **COURSE**	**Nama Mata Kuliah** ***Course Name***	**: Mekanika Komposit** ***Mechanics of Composite***
	Kode MK *Course Code*	TM185224
	Kredit / *Credits*	: 3 sks / 4.8 ECTS
	Semester	: 2/3

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang material komposit dan cara pembuatannya, serta struktur lapisan komposit dan aplikasinya dalam pembuatan produk komposit

Provide knowledge about composite materials and how they are made, as well as the structure of composite layers and their applications in manufacturing composite products

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering
B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth
C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems
D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

- Mampu membuat produk komposit
Able to make composite products
- Mampu merencanakan pembuatan produk lapisan
Able to plan the manufacture of coating products
- Mampu menganalisa hasil produk lapisan.
Being able to analyze the results of coating products.

POKOK BAHASAN
MAIN SUBJECT

- Klasifikasi material komposit
Classification of composite materials
- Pengenalan material anisotropi, fiber mekanika mikro dan makro material komposit
Introduction of anisotropy materials, micro mechanics fiber and macro composite materials
- Pengertian lamina, laminat, struktur komposit
Understanding lamina, laminat, composite structure
- Kriteria kegagalan komposit
Composite failure criteria
- Aplikasi teknik
Engineering Application

PUSTAKA UTAMA
MAIN REFERENCE

1. Jones R.M., Mechanics of Composite Materials, Hemisphere Publishing Co., New York, 1975.
2. Gibson, R.F., Principles of Composite Material Mechanics, Mc. Graw Hill Inc., New York,1994
3. Kaw, A.K., Mechanics of Composite Materials, CRL Press New York, 1997.

18. SILABUS KOMPUTASI FLUIDA & PERPINDAHAN PANAS */ SYLLABUS OF COMPUTATIONAL FLUID AND HEAT TRANSFER*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**Komputasi Fluida & Perpindahan Panas** *Computational Fluid and Heat Transfer*
	Kode MK *Course Code*	:	TM185210
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2/3

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Pada mata kuliah ini dipelajari klasifikasi berbagai macam teknik komputasi fluida dan penjelasannya serta pengguna an perangkat lunak CFD untuk menganalisis serta mengevaluasi berbagai metode komputasi fluida.

This subject studies the classification of various fluid computation techniques and their explanations and the use of CFD software to analyze and evaluate various methods of fluid computing.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOMES

Mahasiswa mampu menjelaskan dan mengklasifikasikan berbagai macam teknik komputasi fluida, mendemonstasi kan penggunaan perangkat lunak CFD dan menganalisa serta mengevaluasi berbagai metode komputasi fluida.
Students are able to explain and classify various types of fluid computing techniques, demonstrate the use of CFD software and analyze and evaluate various methods of fluid computing.

POKOK BAHASAN
MAIN SUBJECT

1. Pengenalan metode komputasi untuk fluida dan perpindahan panas. Persamaan
   Introduction of computational methods for fluid and heat transfer. Conservation equation in discrete form
2. Overview persamaan diferensial
   Overview of differential equations
   - Klasifikasi fluida dan kaitannya dengan persamaan diferensial parsial (pers. eliptik, parabolik dan hiperbolik)
     Fluid classification and relation to partial differential equations (elliptic, parabolic and hyperbolic equations)
   - Pengenalan berbagai metode numerik (finite difference, finite element, finite volume)
     Introduction of various numerical methods (finite difference, finite element, finite volume)
3. Metode penyelesaian numerik

Numerical settlement method

- Skema diskretisasi utk pers. konveksi-difusi dan keakuratannya(1st order, 2nd order, QUICK). Faktor relaksasi
  Discretization scheme for the press. convection-diffusion and accuracy (1st order, 2nd order, QUICK).
- Metode penyelesaian segregated dan coupled, kopling tekanan dan kecepatan
  Segregated and coupled settlement methods, pressure and speed couplings (SIMPLE, SIMPLER, SIMPLEC)
- Metode penyelesaian unsteady (implicit, explicit, Crank-Nicolson)
  Unsteady settlement method (implicit, explicit, Crank-Nicolson)

4. Pembuatan mesh/grid dan kondisi batas
   Making mesh / grid and boundary conditions
5. Postprocessing hasil simulasi
   Postprocessing simulation results
6. Penyelesaian kasus turbulen. Teori turbulensi, RANS, Boundary layer (wall treatment)
   Settlement of turbulent cases. Turbulence theory, RANS, Boundary layer (wall treatment).
7. Aplikasi perangkat lunak komersil. Studi kasus. Simulasi numerik, pembuatan laporan
   Commercial software applications. Case study. Numerical simulation, report making and presentation

PUSTAKA UTAMA
MAIN REFERENCE

1. Versteeg and Malalasekera, An Introduction to Computational Fluid Dynamics – The Finite Volume Method.
2. Christopher J. Freitas, “The issue of numerical uncertainty”, Applied Mathematical Modelling 26 (2002) 237–248.

19. SILABUS KINEMATIKA DAN DINAMIKA LANJUT / *SYLLABUS OF ADVANCED KINEMATIC AND DYNAMICS*

MATA KULIAH COURSE	**Nama Mata Kuliah** ***Course Name***	**:**	**Kinematika & Dinamika Lanjut** **Advanced Kinematic and Dynamics**
	Kode MK *Course Code*	**:**	TM185204
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberi pengetahuan dan kemampuan untuk sintesa dan analisa gerak (kinematika) suatu mekanisme secara grafik dan analitis serta menganalisa gaya-gaya/momen reaksi secara dinamik pada sambungan mekanisme.

Giving knowledge and ability for synthesis and analysis of motion (kinematics) of a mechanism graphically and analytically as well as analyzing reaction forces / moments dynamically at the mechanism connection.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mahasiswa mampu membuat sintesa dan menganalisa kinematika suatu mekanisme
  Students are able to synthesize and analyze the kinematics of a mechanism
- Mahasiswa mampu menganalisa gaya/momen reaksi secara dinamik pada suatu mekanisme.
  Students are able to dynamically analyze the reaction force / moment on a mechanism.

POKOK BAHASAN
MAIN SUBJECT

- Analisa displacement, velocity dan acceleration mekanisme planar.
  Analysis of displacement, velocity and acceleration of the planar mechanism.
- Gaya-gaya pada joint sebuah mekanisme, penyelesaian aljabar linear, Gauss Eliminasi.
  The forces on a joint mechanism, linear algebraic settlement, Gauss Elimination.
- Synthesa mekanisme secara grafis dan analitis. Motion, path, function generation secara grafis.
  Synthesa mechanism graphically and analytically. Motion, path, function generation graphically.
- Bloch & freudenstein method untuk 3 dan lebih dari tiga titik akurat. Coupler curve.
  Bloch & freudenstein method for 3 and more than three accurate points. Coupler curve.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Jack T. Kimbrel, “Kinematics Analysis and Synthesis”, McGraw-Hill, Inc, New York, 1991
2. Asok Kumar Malik, Amitabha Ghosh, & Guter Dittrich, "Kinematics Analysis and Synthesis of Mechanisms", CRC Press, Inc, Florida.

20. SILABUS TERMODINAMIKA LANJUT / *SYLLABUS OF ADVANCED THERMODYNAMICS*

MATA KULIAH COURSE	**Nama Mata Kuliah** *Course Name*	:	**TERMODINAMIKA LANJUT** *Advanced Thermodynamics*
	Kode MK *Course Code*	:	TM185204
	Kredit / *Credits*	:	3 sks / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang termodinamika secara teoritis dan praktek serta apalikasinya di industri.

Providing knowledge about thermodynamics in theory and practice and its application in industry.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering
B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth
C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems
D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu memahami konsep hukum I dan II termodinamika secara menyeluruh
Able to understand the concepts of law I and II thermodynamics as a whole
- Mampu mengaplikasikan konsep termodinamika pada analisa energi pada suatu pembangkit
Able to apply the concept of thermodynamics to energy analysis in a generator
- Mampu mengembangkan model termodinamika
Able to develop thermodynamic models

POKOK BAHASAN
MAIN SUBJECT

- Definisi dan konsep dasar termodinamika, sistem dimensi & satuan
Basic definitions and concepts of thermodynamics, system dimensions & units
- Hukum I termodinamika, Hukum II termodinamika and Entropi.
Law I thermodynamics, Law II thermodynamics and Entropy.

- Sifat dan tingkat keadaan zat tunggal, kompresibel sederhana,
  The nature and state of simple, compressible substances
- Analisis energi
  Energy analysis

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Moran, J Michael & Howard N. Saphiro, Fundamental of Engineering Thermodynamics, Fourt Edition, New York: John Wiley & Sons Inc., 2000.
2. Reynold Perkins, Engineering Thermodynamics, Edisi ketiga, Jakarta, Airlangga, 1994.

21. SILABUS TEKNIK PEMBAKARAN / *SYLLABUS OF COMBUSTION ENGINEERING*

MATA KULIAH COURSE	**Nama Mata Kuliah** ***Course Name***	**:**	**TEKNIK PEMBAKARAN** ***Combustion Engineering***
	Kode MK ***Course Code***	:	**TM185214**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang bahan bakar, proses pemmbakaran, analisi ruang bakar dan aplikasinya

Provides knowledge about fuel, combustion processes, combustion chamber analysis and application

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu mengenal jenis jenis bahan bakar
  Being able to recognize the types of fuel types
- Memahami proses pembakaran
  Understand the combustion process
- Mampu menganalisa ruang bakar, peralatan pembakaran serta aplikasinya
  Able to analyze combustion chambers, combustion equipment and their applications

POKOK BAHASAN
MAIN SUBJECT

- Pengenalan bahan bakar
  Introduction of fuel
- Proses pembakaran
  Combustion process
- Lidah api
  Flame
- Analisi ruang bakar
  Analyze combustion chamber

- Perlatan pembakaran dan praktikum
  Combustion equipment and practicum

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Kuo, Fundamental of Combustion, John Wiley & Sons.
2. Turn, Stephen R, An Introduction to Combustion
3. Jenbacher, Energy System, 1977

22. SILABUS MANAJEMEN DAN EKONOMI ENERGI / *SYLLABUS OF ECONOMICS AND ENERGY MANAGEMENT*

MATA KULIAH COURSE	**Nama Mata Kuliah** *Course Name*	:	**MANAJEMEN DAN EKONOMI ENERGI** *Energy Economics and Management*
	Kode MK/*Course Code*	:	**TM185213**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Kuliah ini bertujuan untuk memberikan pemahaman terhadap mananejemen energi dan strategi dan perencanaan energi baik di industri maupun zona industri.

This lecture aims to provide an understanding of energy management and energy planning and strategy both in industry and industrial zones.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu memahami prinsip prinsip audit energi pada berbagai sektor
Able to understand the principles of energy auditing in various sectors
- Mampu mengaplikasikan penghematan energi di industri
Able to apply energy savings in the industry
- Mampu memahami tentang perencaan energi dan strateginya di sektor industri
Able to understand about energy planning and its strategy in the industrial sector

POKOK BAHASAN
MAIN SUBJECT

- Pengantar energi manajemen secara global.
Introduction to global energy management.
- Audit energi di berbagai sektor, antara lain sektor industri, perhotelan rumah tangga.

Energy audits in various sectors, including industry, hotel hospitality.

- Usaha-usaha penghematan energi yang berkaitan dengan sistem kontrol di industri.
  Energy saving efforts related to control systems in the industry.
- Konsep Demand Side management (DSM).
  The concept of Demand Side management (DSM).
- Perencanaan dan Strategi Energi dalam kawasan industri.
  Energy Planning and Strategy in industrial estates.
- Perencanaan energi listrik.
  Electrical energy planning.
- Implementasi energi manajemen.
  Energy management implementation.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Turner, Wayne C., Energy Management Handbook 3rd, Ed. London: Fairmont Press, 1997.
2. O'Callahan, Paul, Energy Management, New York: McGraw Hill, 1993.
3. Kleinpeter, Maxime., Energy Planning & Policy, New York: John Wiley & Sons, 1995.

23. SILABUS ANALISA KEGAGALAN MATERIAL / *SYLLABUS OF FAILURE ANALYSIS OF MATERIALS*

MATA KULIAH COURSE	**Nama Mata Kuliah** *Course Name*	:	**ANALISA KEGAGALAN MATERIAL** *Failure Analysis of Materials*
	Kode MK/*Course Code*	:	**TM185220**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Increase knowledge to understand and utilize the concepts of material strength in design and engineering.

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

1. Able to analyze stress-strain load conditions in a structure / construction

2 Being able to analyze the failure of a structure / construction

POKOK BAHASAN
MAIN SUBJECT

- Design concepts based on material strength
- Material mechanical properties for design
- Load analysis, Multi-dimensional Static Stress Strain
- Static Load Failure Analysis
- The concept of Residual Voltage
- Stress-Strain Analysis of Thin Wall Cylinders, Thick Walls and Layered Cylinders
- Shock Loads and Dynamic Loads
- Mechanical properties of material fatigue for design
- Multi-dimensional dynamic voltage load analysis
- Analysis of Fatigue Dynamic Failure Analysis
- Contact Voltage

PRASYARAT ***PREREQUISITES***
PUSTAKA UTAMA ***MAIN REFERENCE***
1 Robert C. Juvinal, Engineering Consideration of Stress, Strain and Strength, Mc Graw-Hill, New York, 1967 2 Joseph H. Faupel, Franklin E. Fisher, Engineering Design, A Synthesis and Material Engineering, A Wiley Interscience, John Wiley & Sons, New York , 1981 3 J. A. Collin, Failures of Mechanical Design, A Wiley Interscience, John Wiley & Sons, New York, 1981 4 Arthur P. Boresi, Omar M Sidebottom, Advanced Mechanics of Materials, John Wiley & Sons, New York, 1985 5 Weaver & Gere, Analisa Matriks untuk Struktur Rangka, Penerbit Erlangga, Jakarta 6 James W. Dally , William F. Riley, Experimental Stress Analysis, Mc Graw-Hill, New York, 1991

24. SILABUS PERPINDAHAN PANAS DAN MASA / *SYLLABUS OF HEAT AND MASS TRANSFER*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**PERPINDAHAN PANAS DAN MASA** **Heat and Mass Transfer**
	Kode MK/*Course Code*	:	**TM185203**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang perpindahan panas dan masa pada sebuah system, baik perpindahan panas secara konduksi, konveksi dan radiasi

Provide knowledge about heat and mass transfer in a system, both heat transfer by conduction, convection and radiation

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu menganalisa perpindahan panas dan masa pada system
  Able to analyze heat and mass transfer in the system
- Mampu menjelaskan phenomena perpindahan konveksi baik yang single phase maupun dua phase
  Able to explain the phenomenon of convection displacement both single phase and two phase
- Mampu merancang pesawat perpindahan panas dan masa
  Able to design heat and mass transfer planes

POKOK BAHASAN
MAIN SUBJECT

- Konsep perpindahan panas konduksi satu, dua dan tiga dimensi, dengan energi bangkitan, tunak, sources dan sinks, melting dan solidifacation.

The concept of one, two and three dimensional conduction heat transfer, with energy generation, steady, sources and sinks, melting and solidification.

- Pengertian fisik perpindahan panas konveksi paksa, lapisan batas laminar dan turbulen pada aliran luar dan dalam, konveksi bebas.
  Physical understanding of forced convection heat transfer, laminar and turbulent boundary layers in the outer and inner flow, free convection.

- Konsep perpindahan panas secara radiasi, benda hitam, radiasi antar permukaan, difusi-permukaan abu-abu, pengaruh media radiasi.
  The concept of radiant heat transfer, black matter, inter-surface radiation, gray surface diffusion, the influence of radiation media.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Bejan, Adrian, Heat Transfer, New York: John Wiley and Sons, 1993.
2. Kays, W.M. and Crawford, M.E., "Convective Heat and Mass Transfer", 3rd Ed, New York: Mc Graw-Hill Inc, 1993.
3. Holman, J.P., "Heat Transfer", 6th Ed, New York: Mc Graw-Hill Inc, 1993.

25. SILABUS PROSES PEMESINAN / *SYLLABUS OF MACHINING PROCESS*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**PROSES PEMESINAN** *Machining Process*
	Kode MK/*Course Code*	:	**TM185207**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang proses pemotongan logam dan material padat lainnya, parameter proses dan pengaruhnya terhadap biaya, waktu, dan kualitas permukaan suatu benda kerja, sehingga dapat diketahui dan ditentukan proses pemesinan yang optimal

This course provides knowledge about the process of cutting metals and other solid materials, process parameters and their effects on the cost, time, and surface quality of a workpiece, so that optimal machining processes can be identified and determined

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu memilih proses pemesinan yang sesuai dengan material
Being able to choose the machining process in accordance with the material

- Mampu memilih dan menentukan parameter proses pemesinan yang optimal
Able to choose and determine optimal machining process parameters

- Mampu menentukan parameter proses yang dapat mempengaruhi hasil proses pemesinan.
Being able to determine the process parameters that can affect the results of the machining process.

POKOK BAHASAN
MAIN SUBJECT

- Review proses-proses pemesinan
Review machining processes

- Optimasi proses pemesinan

Optimization of machining processes

- Uraian macam dan penggunaan mesin NC/CNC, aplikasi, manfaat dan tinjauan ekonomis
  Details and types of NC / CNC machines, applications, benefits and economical reviews
- Sistem peralatan NC: elektronik, mekanis, hidrolik maupun pneumatik
  NC equipment systems: electronic, mechanical, hydraulic or pneumatic.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Schey, A. J., Introduction to Manufacturing Processes, 3rd edition, McGraw Hill, 2000
2. Kalpakjian, S., and Schmid, S., Manufacturing Processes for Engineering Materials, 4th edition, Addison Wesley, 2003

26. SILABUS METALURGI MANUFAKTUR / *SYLLABUS OF MANUFACTURING OF METALLURGY*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**METALURGI MANUFAKTUR** *Manufacturing of Metallurgy*
	Kode MK/*Course Code*	:	**TM185223**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Memberikan pengetahuan tentang sambungan material logam, proses lasan dan material las yang bisa dimanufaktur

Provide knowledge about metal material connections, weld processes and welding materials that can be manufactured

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Mampu merancang sebuah produk las-lasan yang memenuhi syarat teknik
Able to design a welding product that meets engineering requirements
- Mampu menganalisa hasil las-lasan
Able to analyze the results of welding
- Mampu mengevaluasi dan mengembangkan produk las-lasan.
Able to evaluate and develop welding products.

POKOK BAHASAN
MAIN SUBJECT

- Pembekuan pada coran dan aliran panas
Freezing in castings and heat flow
- Model pembekuan plane front, cellular dan dendritik pada coran, stabilitas dan distribusi unsur paduan.
Plane, cellular and dendritic freezing models in castings, stability and distribution of alloy elements.

- Proses pengelasan & pemotongan, siklus thermal, kecepatan pendinginan dan metalurgi las.
  Welding & cutting process, thermal cycle, cooling speed and welding metallurgy.
- Deformasi,dislokasi dan mekanisme penguatan material.
  Deformation, dislocation and material strengthening mechanism.

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Flemings, Merton Chapter, Solidification Processing, New York: Mc Graw Hill Book Company, 1974
2. ”Welding Handbook“, Fundamentals of Welding Vol.1: Americal Welding Society ,Miami,Florida, Vol 1 (1976) : 33125
3. Dieter,George E., Mechanical Metallurgy, Singapore: Mc Graw hill Inter-national Book Company, 1981

27. SILABUS ENERGY SURYA / *SYLLABUS OF SOLAR ENERGY*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**ENERGI SURYA** ***Solar Energy***
	Kode MK/*Course Code*	:	TM185211
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Kuliah ini memberikan pengetahuan tentang estimasi ketersedian radiasi surya, perpindahan panas pada sistem enersi surya, unjuk kerja kolektor dan sel surya, serta aplikasinya

This lecture provides knowledge about the estimation of the availability of solar radiation, heat transfer in solar energy systems, the performance of collectors and solar cells, and their applications

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Dapat memahami cara mengukur radiasi surya dan potensinya
  Can understand how to measure solar radiation and its potential
- Dapat melakukan estimasi ketersedian radiasi surya di suatu daerah, perpindahan panas pada sistem enersi surya,
  Can estimate the availability of solar radiation in an area, heat transfer in the solar energy system
- Dapat memahami konsep kolektor dan unjuk kerja kolektor, konsep dan unjuk kerja sel surya dan aplikasi pemanfaatan enersi surya untuk pemanas, pendingin, dan pembangkit tenaga listrik.

  Can understand the concepts of collector and collector performance, solar cell concepts and performance and the application of solar energy utilization for heating, cooling, and power generation.

POKOK BAHASAN
MAIN SUBJECT

- Potensi dan pengukuran radiasi surya,

Potential and measurement of solar radiation

- Estimasi ketersedian radiasi surya di suatu daerah, perpindahan panas pada sistem enersi surya,
  Estimated availability of solar radiation in an area, heat transfer in the solar energy system
- Konsep kolektor dan unjuk kerja kolektor, konsep dan unjuk kerja sel surya,
  Collector concept and collector performance, solar cell concept and performance
- Aplikasi pemanfaatan enersi surya untuk pemanas, pendingin, dan pembangkit tenaga listrik.
  Application of solar energy utilization for heating, cooling and power generation

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Duffie, John A., and William A., Beckman, Solar Engineering of Thermal process, 2nd edition, John Wiley & Sons Inc., 1992.
2. Charters W.W.S. and Trevor L., Pyror, Solar Energy : Theory and design of Solar Thermal Systems, Melbourne: Victorian Solar Energy Council, 1982.
3. Anderson Edward E., Fundamental of Solar Energy Conversion, Canada Addison Wesley Publishing Co., 1983.

28. SILABUS ALIRAN DUA FASE / *SYLLABUS OF TWO-PHASE FLOW*

MATA KULIAH *COURSE*	**Nama Mata Kuliah** *Course Name*	:	**Aliran Dua Fase** **Two-Phase Flow**
	Kode MK/*Course Code*	:	**TM185212**
	Kredit/*Credit*	:	3 SKS / 4.8 ECTS
	Semester	:	2

DESKRIPSI MATA KULIAH
DESCRIPTION of COURSE

Kuliah ini bertujuan untuk memberikan pengetahuan tentang persamaan dasar & model matematis untuk berbagai tipe aliran, pengetahuan tentang teknik pengukurannya dan aplikasinya di industri

This course aims to provide knowledge about basic equations & mathematical models for various types of flow, knowledge of measurement techniques and their application in industry

CAPAIAN PEMBELAJARAN PRODI YANG DIDUKUNG
PROGRAM LEARNING OUTCOMES

A. Kemampuan memahami dan memanfaatkan teori keilmuan teknik dalam bidang teknik mesin.
Able to understand and utilize theory of engineering sciences in mechanical engineering

B. Kemampuan menilai konsep teoritis dan metode desain sistem atau teknologi teknik mesin secara mendalam.
Able to familiarise and assess theoretical concepts and methods of system design or mechanical engineering technology in depth

C. Kemampuan menganalisis dan memecahkan permasalahan teknik dan teknologi.
Able to analyse and solve engineering and technology problems

D. Kemampuan mengembangkan sistem desain mekanik yang inovatif dan komponen-komponen di dalamnya dengan memanfaatkan keilmuan interdisiplin atau multidisiplin.
Able to develop an innovative design mechanical system and their components by utilizing interdisciplinary or multidisciplinary scientific fields

CAPAIAN PEMBELAJARAN MATA KULIAH
COURSE LEARNING OUTCOME

- Dapat memahami aplikasi di industri dan coraknya
  Can understand the application in the industry and style
- Dapat memahami teknik pengukuran pada aliran dua fase
  Can understand measurement techniques in two-phase flow
- Mampu mengembangkan persamaan dasar dan model matematik pada berbagai tipe aliran
  Able to develop basic equations and mathematical models in various types of flow

POKOK BAHASAN
MAIN SUBJECT

- Konfigurasi Aliran Dua Fase

Two Phase Flow Configuration

- Teknik Pengukuran
  Measurement technique
- Mekanika Zat Kontinyu Monofase
  Mechanics of Monophase Continuous Substances
- Persamaan lokal sesaat dalam setiap fase dan pada Interfase
  Local equations are instantaneous in each phase and in Interphase
- Persamaan Rata-rata
  Average Equation
- Pemodelan Aliran Dua-Fase
  Modeling Two-Phase Flow
- Kehilangan Tekanan Akibat Gesekan
  Losing Pressure Due To Friction

PRASYARAT
PREREQUISITES

PUSTAKA UTAMA
MAIN REFERENCE

1. Delhaye J.M., Giot M. & Riethmuller M.L. Thermohydraulics of Two-phase Systems for Industrial Design and Nuclear Engineering, Hemisphere/McGraw-Hill. 1981
2. Bird R.B., Stewart W.E., & Ligthfoot E.N. Transport Phenomena, New York : John Wiley & Sons Inc.,. 1965
3. Bergles A.E., Collier J.G., Delhaye J.M., Hewitt G.F., and Mayinger F. Two-phase Flow and Heat Transfer in the power and Process industries. Hemisphere/McGraw-hill. 1981