

STRUKTUR KURIKULUM PROGRAM STUDI TEKNIK MESIN S2

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
	Wajib Peminatan	Specialization Course	8
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
	Wajib Peminatan	Specialization Course	4
		Subtotal	10
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
	Wajib Peminatan	Specialization Course	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	10
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	4
		Total	44

1. Konversi Energi

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801101	Termodinamika Lanjut	Advanced Thermodynamics	4
ENME801102	Dinamika Fluida dan Perpindahan Kalor Lanjut	Advanced Fluid Dynamics and Heat Transfer	4
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802103	Optimasi Sistem Energi	Energy Optimization System	4
		Subtotal	10
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803104	Pembangkitan Daya Termal	Thermal Power Generation	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	12
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Konversi Energi

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803105	Motor Pembakaran Dalam	Internal Combustion Engine	4
ENME803106	Pengukuran dan Visualisasi Aliran Terapan	Applied Flow Measurement and Visualization	4
ENME803107	Aplikasi CFD	CFD Application	4
ENME803196	Propulsi Jet dan Roket	Jet and Rocket Propulsion	4
ENME803125	Energi dan Lingkungan	Energy and Environment	4
ENME803108	Teknik Refrijerasi	Refrigeration Engineering	4
ENME803124	Audit Energi	Energy Audit	4
KODE	SEMESTER 4	4th SEMESTER	SKS
ENME804109	Rekayasa Penukar Kalor dan Massa	Heat and Mass Transfer Engineering	4
ENME804110	Teknik Pembakaran	Combustion Engineering	4
ENME804111	Teknik Aerodinamika	Aerodynamics Engineering	4
ENME804112	Mesin - Mesin Turbo	Turbomachinery	4

2. Sistem Utilitas Bangunan dan Keselamatan Kebakaran

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801129	Radiasi	Radiation	2
ENME801113	Sistem Ventilasi dan Tata Udara	Ventilation and Air Conditioning System	4
ENME801130	Pengantar Dinamika Api	Introduction to Fire Dynamics	2
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802131	Sistem Proteksi Kebakaran	Fire Protection System	2
ENME802132	Sistem Mekanikal dan Elektrikal Gedung	Building Mechanical and Electrical System	2
		Subtotal	10
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803133	Tugas Perencanaan Sistem Utilitas Bangunan Gedung	Assignment of Building Utility System Design	2
ENME801121	Sistem Manajemen Energi	Energy Management System	2
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	8
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Sistem Utilitas Bangunan dan Keselamatan Kebakaran

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803134	Dinamika Api dalam Ruang dan Pemodelan	Enclosure Fire Dynamics and Modelling	4
ENME803115	Sistem Ruang Bersih	Clean Room	4
ENME803116	Sistem Plambing dan Pengolahan Air Limbah	Plumbing and Waste Water Treatment System	4
ENME803117	Asesmen Lingkungan Bangunan Gedung	Building Environment Assessment	4
ENME803135	Teknik dan Strategi Pemadaman Kebakaran	Fire Fighting Engineering and Strategy	4
ENME803136	Manajemen Keselamatan Kebakaran pada Bangunan	Fire Safety Management in Building	4
KODE	SEMESTER 4	4th SEMESTER	SKS
ENME802103	OPTIMASI SISTEM ENERGI	ENERGY SYSTEM OPTIMIZATION	4
ENME804118	Perancangan Sistem Mekanikal Bangunan Gedung	Mechanical system for Building	4
ENME804119	Akustik	Accoustics	4
ENME804120	Manajemen Pemeliharaan Utilitas Bangunan Gedung	Maintenance Management of Building Utility	4
ENME804137	Teknik Investigasi Kebakaran	Fire Investigation Engineering	4
ENME804138	Evaluasi dan Pemeliharaan Sistem Proteksi Kebakaran	Evaluation and Maintenance of Fire Protection System	4
ENME804139	Proteksi Kebakaran di Industri Proses	Fire Protection in Process Industry	4

3. Perancangan dan Manufaktur

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801140	Material dan Proses Manufaktur	Materials and Manufacturing Processes	4
ENME801141	Metodologi Perancangan dan Pengembangan Produk	Product Design and Development Methodology	4
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802142	Integrasi Teknologi Perancangan dan Manufaktur	Design and Manufacturing Technology Integration	4
		Subtotal	14
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803143	Kegagalan Mekanikal	Mechanical Failure	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	12
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Perancangan dan Manufaktur

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803145	Pengembangan Produk Komposit	Composite Product Development	4
ENME803146	Finite Element dan Multiphysics	Finite Element and Multiphysics	4
ENME803147	Perancangan dan Pengembangan Produk Edukasi	Toy Production Design	4
ENME803161	Proses Permesinan Mikro	Micromachining Process	4
ENME803144	Dinamika Sistem Mekanikal	Dynamics of Mechanical System	4
SEMESTER 4		4th SEMESTER	
ENME804148	Perancangan untuk Manufaktur dan Perakitan	DESIGN FOR MANUFACTURING AND ASSEMBLY	4
ENME804149	Kebisingan dan Getaran	Noise and Vibration	4
ENME804162	Laser Assisted Process	Laser Assisted Process	4

4. Sistem Manufaktur dan Otomasi

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801150	Manajemen Sistem Informasi Manufaktur	Management of Manufacturing Information System	4
ENME801151	Proses dan Sistem Manufaktur	Manufacturing System and Processes	4
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802152	Otomasi dan Robotika	Automation and Robotics	4
		Subtotal	10
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803153	Sistem Machine Vision	Machine Vision System	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	12
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Sistem Manufaktur dan Otomasi

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803154	Sistem Manajemen Produksi dan Mutu	Quality and Production Management System	4
ENME803174	Manajemen Risiko	Risk Management	4
SEMESTER 4		4th SEMESTER	
ENME804155	CAD/CAM	CAD/CAM	4
ENME804156	Penilaian Kinerja Manufaktur	Manufacturing Performance Assessment	4

5. Teknik Kendaraan dan Peralatan Berat

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801163	Rekayasa Kendaraan dan Alat Berat	Vehicle Engineering and Heavy Duty Equipment	4
ENME801164	Sistem Penggerak Mula dan Penyalur Daya	Prime Mover and Powertrain System	4
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802165	Rekayasa Rangka dan Badan Kendaraan	Vehicle Frame and Body Engineering	4
		Subtotal	10
SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803166	Sistem Pengendalian Kendaraan	Vehicle Control System	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	12
SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Teknik Kendaraan dan Peralatan Berat

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803167	Teknologi Mutakhir Kendaraan	Modern Vehicle Technology	4
ENME803195	Peralatan Pengeboran Minyak dan Gas	Oil and Gas Drilling Equipment	4
SEMESTER 4		4th SEMESTER	
ENME804168	Teknik Kendaraan Rel	Railway Engineering	4
ENME804197	Mesin dan Peralatan Pengangkat	Handling and Construction Equipment	4
ENME804198	Sistem Kendali dan Stabilitas Pesawat Terbang	Airplane Control System and Stability	4

6. Sumber Daya dan Teknologi Maritim

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 1		1st SEMESTER	
ENME801001	Matematika Teknik Lanjut	Advanced Engineering Mathematics	4
ENME801179	Termofluida Lanjut	Advanced Thermofluid	4
ENME801180	Sumber Daya Maritim	Maritime Resources and Technologies	4
		Subtotal	12
SEMESTER 2		2nd SEMESTER	
ENME802002	Desain Penelitian	Design of Experiment	2
ENME802003	Penulisan Akademik	Academic Writing	2
ENME802004	Komputasi Teknik	Engineering Computation	2
ENME802181	Teknologi dan Manajemen Maritim	Maritime Engineering and Management	4
		Subtotal	10
KODE SEMESTER 3		3rd SEMESTER	
ENME800005	Publikasi Ilmiah	Scientific Publication	2
ENME800006	Seminar	Seminar	2
ENME803182	Energi Laut	Ocean Energy	4
	Pilihan Peminatan #1	Elective Course #1	4
		Subtotal	12
KODE SEMESTER 4		4th SEMESTER	
ENME800007	Tesis	Thesis	6
	Pilihan Peminatan #2	Elective Course #2	4
		Subtotal	10
		Total	44

MK PILIHAN Peminatan Sumber Daya dan Teknologi Maritim

Kode	MATA KULIAH	SUBJECT	sks
SEMESTER 3		3rd SEMESTER	
ENME803183	Bangunan Lepas Pantai	Marine and Offshore Structure*	4
ENME803184	Manajemen Transportasi Laut dan Kepelabuhan	Sea Transportation and Port Management *	4
ENME803185	Hukum dan Peraturan Kemaritiman	Maritime Law and regulation*	4
SEMESTER 4		4th SEMESTER	
ENME804186	Kapal Khusus	Special Ship Project	4
ENME804187	Manajemen Produksi Kapal	Ship Production Management*	4
ENME802103	Optimasi Sistem Energi	Energy Optimization System	4
ENME804188	Manajemen Energi Maritim	Maritime Energy Management	4
ENME804189	Keselamatan Kemaritiman	Maritime Safety	4
ENME804190	Teknik Las Lanjut	Advanced Welding Engineering	4

SILABUS MATA KULIAH S2 TEKNIK MESIN

Deskripsi Mata Ajaran

ENME800001

MATEMATIKA TEKNIK LANJUT (4 SKS)

Tujuan Pembelajaran:

Tujuan dari mata ajaran ini adalah mengembangkan kemampuan analitik mahasiswa. Mahasiswa mengerti dan mampu menggunakan konsep matematika teknik lanjut dalam menyelesaikan permasalahan teknik.

Silabus :

Pengenalan Persamaan Differensial; Persamaan Differensial Orde 1; Persamaan Differensial Orde 2; Persamaan Differensial Orde Tinggi; Analisis Vektor; Differensial Vektor; Operasi Grad, Divergence dan Curl; Integral Vektor; Transformasi Laplace; Penyelesaian Persamaan Differensial menggunakan Transformasi Laplace; Transformasi Fourier; Konvolusi; Metode Numerik: Akar persamaan, Diffensial Numerik, Integral Numerik; Solusi Persamaan Differensial Parsial.

Prasyarat: -

Buku Ajar:

1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENME800003

DESAIN PENELITIAN (2 SKS)

Tujuan Pembelajaran:

Kuliah Desain Penelitian memberikan pengetahuan mengenai metode-metode perencanaan, pelaksanaan dan pelaporan suatu penelitian di bidang rekayasa teknik sehingga mampu menerapkan kaidah-kaidah ilmiah baku dalam penyusunan tesis khususnya serta dalam suatu karya ilmiah hasil penelitian pada umumnya. Melalui mata ajaran ini mahasiswa diharapkan mampu untuk mengelola suatu penelitian yang dimulai dari tahapan perencanaan, menerapkan secara benar prosedur desain dan konstruksi apparatus, dan mengaplikasi instrumentasi dan sistem pengukuran, melakukan eksekusi serta melakukan analisis dan interpretasi atas data dengan kaidahkaidah statistik yang tepat.

Silabus:

Pendahuluan: Pengantar Desain Penelitian; Pendekatan-pendekatan Penyelesaian Masalah (Problem Solving Approaches); Perencanaan Proyek Penelitian; Desain dan Aplikasi Sistem Pengukuran: Elemen-elemen Fungsional Sistem Pengukuran, Karakteristik Kinerja Sistem Pengukuran, Analisis Keakuratan (Ketidakpastian) Sistem; Desain dan Konstruksi Apparatus Penelitian; Perencanaan Eksperimen; Eksekusi Eksperimen: Konstruksi apparatus, Debugging apparatus, Datasheet dan Logbooks; Analisis dan Interpretasi Data; Komunikasi Teknik: Prinsip-prinsip Komunikasi Teknik Baku, Laporan, Paper, dan Artikel Hasil Penelitian.

Prasyarat: -

Buku Ajar:

1. Montgomery, D.C., Design and Analysis of Experiments, (5th ed.), John Wiley and Sons, Inc., New York, 2001
2. Coleman, H.W., Steele, G.W.Jr., Experimentation and Uncertainty Analysis for Engineers, (2nd ed.), John Wiley and Sons, Inc., New York, 1999
3. Doebelin, E.O., Engineering Experimentation: Planning, Execution, Reporting, McGraw-Hill, Inc., New York, 1995
4. Kirkup, Les., Experimental Method: An Introduction to the Analysis and Presentation of Data, John Wiley and Sons Australia, Ltd., Queensland, 1994
5. Lipson, C, Sheth, N.J., Statistical Design and Analysis of Engineering Experiments, Mc-Graw Hill Kogakusha, Ltd., Tokyo, 1973

ENME802003

PENULISAN AKADEMIK (2 SKS)

Tujuan Pembelajaran:

Mahasiswa mampu memahami dasar penulisan akademik agar dapat meningkatkan kemampuan membaca naskah ilmiah, referensi dan menuliskan pendapatnya secara tepat dengan bahasa yang baik dan benar serta efektif. Hal-hal yang terkait dengan Penulisan Akademik melingkupi cara pengembangan pemikiran kritis, penyampaian pendapat/argumentasi, formulasi alasan dasar dan penjelasan, serta cara menyampaikan ide dengan bahasa yang tepat. Mahasiswa juga diharapkan dapat menulis naskah ilmiah dengan teknik yang baik, mampu membuat daftar pustaka dengan benar, mencari sumber referensi yang tepat.

Silabus:

Pendahuluan Penulisan Akademik; Analisis Retorika pada Naskah Ilmiah, Bersikap Kritis dan Argumentasi pada Penulisan Akademik, Teknik-Teknik Penulisan Naskah Ilmiah, Penulisan Draft Naskah Ilmiah, Peer Review dan Revisi Naskah Ilmiah, Mencari Sumber Referensi Ilmiah, Sintesis Naskah Ilmiah, Menyampaikan makalah sebagai hasil pembelajaran mata kuliah ini.

Prasyarat: -

Buku Ajar:

1. Ross, V. *A Brief Guide to Critical Writing*. Philadelphia, PA : Critical Writing Program. 2015.
2. Graff, G., Birkenstein, C. *As He Himself Puts It : The Art of Quoting "They Say / I Say" : The Moves That Matter in*



Academic Writing. New York. 2006

3. Rheingold, H. *Net Smart : How To Thrive Online*. Cambridge, Mass : MIT Press. 2012.

ENME800002

KOMPUTASI TEKNIK (2 SKS)

Tujuan Pembelajaran:

Tujuan dari mata ajaran ini adalah agar mahasiswa mengetahui dengan baik dan mampu menerapkan proses dan metoda (algoritma) perhitungan (numerik dan analitik) keteknikan dalam dunia komputasi secara riil berbasis komputer dan parameter yang mempengaruhi kecepatan dan keakuratan hasil perhitungan.

Silabus :

Pengenalan Aplikasi Komputer: Algoritma dan Analisis Algoritma; Kompleksitas Komputasi; Tipe-Tipe Algoritma; Optimasi dan Representasi Angka; Overflow dan Underflow; Error dan Formula Error dalam Numerik; Akar Persamaan; Metode Finite Divided Difference dalam menghitung Turunan Persamaan; Integrasi Numerik; ODE dan sistem ODE dalam Aplikasi Komputasi; Fast Fourier Transform; PDE dalam Aplikasi Komputasi: Solusi persamaan Eliptik, Parabolik, dan Hiperbolik dengan Metode Numerik; Aplikasi Teknik persamaan PDE Eliptik, Parabolik, dan Hiperbolik; Monte Carlo dalam Aplikasi Komputasi.

Prasyarat: -

Buku Ajar:

1. Chapra, Steven C. and Canale, Raymond P. *Numerical Methods for Engineers* 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. *Advanced Engineering Mathematics* 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, *An Introduction to the Analysis of Algorithms*, Addison Wesley.
4. Cheney W., Kincaid D., *Numerical Mathematics and Computing*, Cole Publishing

ENME800005

PUBLIKASI ILMIAH (2 SKS)

Tujuan Pembelajaran:

Mahasiswa mampu mengembangkan pemikiran logis, kritis, sistematis, dan kreatif yang telah dilakukan melalui penelitian ilmiah dan/atau penciptaan desain dalam bidang ilmu pengetahuan dan teknologi yang memperhatikan dan menerapkan nilai humaniora sesuai dengan bidang keahliannya, berdasarkan konsepsi ilmiah dan hasil kajian yang sesuai dengan kaidah, tata cara dan etika ilmiah yang dituliskan dalam makalah yang telah diterbitkan di jurnal ilmiah terakreditasi atau diterima di jurnal internasional dibawah bimbingan satu atau lebih dosen pembimbing.

Silabus:

Prasyarat : Penulisan Akademik (pernah mengambil), Desain Penelitian (pernah mengambil)

Buku Ajar:

1. Jurnal ilmiah terkait bidang penelitian

ENME800006

SEMINAR (2 SKS)

Tujuan Pembelajaran:

Mahasiswa dibimbing untuk mengaplikasikan pengetahuan dan ilmu yang sebelumnya telah dipelajari untuk melaksanakan penelitian mandiri dibawah bimbingan salah - satu atau lebih dosen pembimbing. Setelah mengikuti perkuliahan ini, mahasiswa diharapkan mampu merancang dan menganalisis dibawah penelitian terbimbing, dan mampu menulis temuan penelitian secara ilmiah dan sistematis dalam format artikel penelitian. Mahasiswa juga diharapkan untuk hadir dan mempertahankan rancangan penelitian yang telah disusun di hadapan para penguji di dalam forum ujian seminar.

Silabus: -

Prasyarat : Telah mengambil 24 sks

Buku Ajar:

1. Panduan Teknik Penulisan Tugas Akhir Universitas Indonesia

ENME800007

TESIS (6 SKS)

Tujuan Pembelajaran:

Mahasiswa dibimbing untuk mengaplikasikan pengetahuan dan ilmu yang sebelumnya telah dipelajari untuk melaksanakan penelitian mandiri dibawah bimbingan salah - satu atau lebih dosen pembimbing. Setelah mengikuti perkuliahan ini, mahasiswa diharapkan mampu membuat konsep penelitian dengan mengaplikasikan teori - teori yang ada. Dengan bimbingan dari dosen pembimbing, mahasiswa diharapkan mampu merancang, integrasi, implementasi, dan menganalisis konsep serta menulis temuan penelitian secara sistematis dan ilmiah dalam bentuk buku tesis. Mahasiswa juga diharapkan untuk hadir dan mempertahankan konsep dan temuan penelitian di hadapan para penguji di dalam forum ujian Tesis.

Silabus:

Prasyarat : Telah mengambil 24 sks

Buku Ajar:

1. Panduan Teknik Penulisan Tugas Akhir Universitas Indonesia

ENME801101- TERMODINAMIKA LANJUT (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman lanjutan mengenai Termodinamika dan aplikasinya sehingga mahasiswa dapat merancang dan melaksanakan penelitian dasar serta dapat melakukan analisis yang meliputi perhitungan sistem Termodinamika dengan benar dan sistematis dalam rangka menemukan solusi terbaik terkait efektivitas penggunaan substansi dan energi, khususnya yang sesuai dengan motto perancangan teknik: Produksi Entropi Rendah, Efisiensi Termal Tinggi, dan Dampak Polusi Rendah.

Silabus:

Dasar - dasar termodinamika dan dinamika gas, kesetimbangan sistem termodinamika, sifat termodinamika sistem, termodinamika campuran gas ideal, review termodinamika kimia, review kinetika kimia, persamaan konservasi untuk sistem reaksi multikomponen, nyala api premixed laminar, metode pengukuran kecepatan nyala api (*bunsen burner*), *flame quenching*, *flamability limit of premixed laminar flame*, *gaseous diffusion flame and combustion of single liquid droplet*, *combustion in compression ignition engine* (motor diesel), *combustion in spark ignition engine* (motor bensin), riset pembakaran pada campuran Hidrokarbon - Oksigen, riset mesin pembakaran dalam, emisi pembakaran, metode eksperimental: pengukuran dan akuisisi tekanan dan temperature, fotografi pembakaran dan deteksi kecepatan nyala api, metode spectrographic, teknik analisis kimia (NDIR, FID, Gas-Chromatography)

Buku Ajar:

1. Holmann, J.P., Thermodynamics, Intl. Student Edition, McGraw Hill, 2005.
2. Kenneth Wark Jr. Thermodynamics, McGraw Hill, 2003.
3. Francis F. Huang, Engineering Thermodynamics, MaxWell Macmillan Intl. Edition, 2000.
4. H.D. Baehr, Thermodynamik, Springer Verlag
5. K. Stephan, Thermodynamik, Grundlagen und technische Anwendung-en, Band 1, Band Springer Verlag.
6. Bejan, Adrian, Advanced Engineering Thermodynamics, Wiley - interscience, 2nd Edition, 1997

ENME801102 - DINAMIKA FLUIDA DAN PERPINDAHAN KALOR LANJUT (4 SKS)**Tujuan Pembelajaran:**

Mempertajam pemahaman mahasiswa didalam studi mekanika fluida yang lebih mendetail untuk menunjang pelaksanaan riset atau implementasi ilmu yang telah diperoleh di dunia industri. Mempelajari mekanisme perpindahan kalor di dalam volume kontrol yang disebabkan oleh adanya perbedaan temperature, perbedaan konsentrasi, dan keterlibatan satu, dua, atau tiga fasa fluida kerja pada saat bersamaan.

Silabus:

Aliran viskos fluida Newtonian, aliran pada kondisi batas, aliran fluida non-Newtonian, Aliran dua fasa, aliran perpindahan partikel, media berpori dan *Fluidized Beds*, aliran turbulen dan pencampuran, *Jet*, *Chimney*, persamaan energi dan momentum, perpindahan panas konduksi 1, 2, dan 3 dimensi, perpindahan panas pada permukaan *extended*.

Buku Ajar:

1. Frank P Incropera, David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
2. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
3. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.
4. Welty R James, Wicks Charles, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 3rd Ed. John Wiley & Sons, 1996, New York
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 6th Ed. Brooks/cole, 2001, USA
7. Abbott I R, Theory of Wing Section, Dover Publications.
8. Bird R B, Transport Phenomena, John Wiley & Sons.

ENME802103 - OPTIMASI SISTEM ENERGI (4 SKS)**Tujuan Pembelajaran:**

Kuliah ini memberikan pemahaman tentang pemodelan matematik, simulasi dan optimisasi suatu sistem energi melalui suatu pendekatan ekonomis dan teknik. Kuliah Optimisasi Sistem Energi bermaksud untuk melengkapi kemampuan seorang mahasiswa agar dapat memahami model matematik, simulasi dan optimisasi suatu sistem termal.

Silabus:

Disain Sistem yang Dapat Bekerja; Evaluasi Ekonomi; Pembentukan Persamaan Matematik; Pemodelan Alat Termal; Simulasi System; Optimisasi System: Objective Function, Constraints; Lagrange Multipliers: pengali Lagrange untuk menyelesaikan proses optimisasi; Dynamics, Geometric dan Linier Programming; Model Matematik Termodinamik Properties; Simulasi Sistem Besar pada Kondisi Stedi; Simulasi Sistem Termal Besar; Perhitungan Besaran Variabel pada Kondisi Optimum.

Prasyarat: Matematika Teknik, Termodinamika Dasar, Mekanika Fluida.

Buku Ajar:

1. Stoecker, W.F. Design of Thermal System, 3rd Edition, Mc.Graw Hill Book Co, 2011.
2. Boehm,R.F., Design of Analysis of Thermal System, John Wiley&Sons,1987.
3. Yogesh Jaluria, Design and Optimization of Thermal Systems, 2nd Edition, Mc.Graw Hill Book Co, 2007.

ENME803104 - PEMBANGKITAN DAYA TERMAL (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman tentang prinsip dasar pembangkitan daya termal, dan memiliki kompetensi dasar dalam menghitung dan merancang sistem pembangkitan daya termal.

Silabus:

Siklus aktual proses termodinamika pembangkit daya, analisis dinamika fluida, analisis kesetimbangan termal, desain boiler / HRS, Desain Fuel handling system, Heat Exchanger, Forced and Induced Fan, Flue gas system, Soot blowing system, Infrasonic cleaner, Desalination plant, Demineralized plant, Potable water plant.

Buku Ajar:

1. Tyler G. Hicks, Power Plant Evaluation and Design Reference Guide, McGraw Hill, 1986.
2. Sill and Zoner, Steam Turbine Generator Process Control and Diagnostics, Wiley Higher Ed., 1996.
3. Saranavamuttoo et.al, Gas Turbine Theory, 6th Edition, Prentice Hall, 2008.
4. Black and Veath-Power plant engineering , Philips Keameh-Power generation handbook
5. Steam Generators by Babcock Willcock
6. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.

ENME803105- MOTOR PEMBAKARAN DALAM (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa mempunyai kompetensi dan keahlian peminatan dalam prinsip kerja dan teori motor pembakaran dalam serta mampu melakukan perhitungan konstruksi dan rancangan.

Silabus:

Siklus-Siklus Aktual Motor Pembakaran Dalam; Sistem Bahan Bakar; Penyalaan dan Pembakaran pada Motor Spark Ignition dan Compressed Ignition; Beberapa Karakteristik Dasar dan Perhitungannya; Dasar - Dasar Perancangan Motor; Penentuan Bagian-Bagian Utama Motor; Analisis Kinematika dan Dinamika Bagian Yang Bergerak; Perhitungan dan Perencanaan. Sistem Pelumasan dan Pendinginan.

Prasyarat: Termodinamika Dasar, Mesin Konversi Energi

Buku Ajar:

1. Guzela L, Onder, C., Introduction to Modelling and Control of Internal Combustion Engines, 2nd Edition, Springer, 2014
2. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 2011
3. Taylor, C.F., Internal Combustion Engines, in Theory and Practice, M.I.T Press, England, 1985.
4. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.

ENME803106- PENGUKURAN DAN VISUALISASI ALIRAN TERAPAN (4 SKS)**Tujuan Pembelajaran:**

Diagnostik aliran terapan mengkaji teknik-teknik pengukuran dan visualisasi aliran yang luas penerapannya baik di industri maupun di laboratorium. Kuliah Diagnostik Aliran Terapan memberikan kompetensi dasar seorang mahasiswa agar mampu memahami berbagai metode pengukuran dan visualisasi aliran serta dapat melakukan perencanaan yang tepat sistem diagnostik aliran dalam suatu terapan instalasi proses di industri maupun untuk set-up eksperimental dalam riset ilmiah yang berkaitan dengan aliran fluida.

Silabus :

Statistik Diagnostik Aliran; Kalibrasi dalam Pengukuran Aliran; Momentum Sensing Meter (Orifice plate, venturi, nozzle meters); Positive Displacement Flow Meter (Nutating Disk, Sliding Vane, Gear meter, etc.); Electromagnetic and Ultrasonic Flow Meters; Compressible Flow Meter (Wet Gas and Wind Anemometer); Principles Local Velocity Measurement in Liquid and Gases; Hot Wire Anemometry; Laser Based Velocimetry (LDV, PIV); Principles of Flow Visualization; Conventional Flow Visualization; Shadowgraphs and Schliern Technique; Interferometry Technique; Light Sheet Based Technique; Image Processing and Computer-Assisted Method

Prasyarat: Mekanika Fluida, Sistem Fluida

Buku Ajar:

1. Yang ,W.J, Handbook of Flow Visualization, Taylor and Francis. 2001
2. Baker, R.C., Flow Measurement Handbook: Industrial Designs, Operating Principles, Performance and Applications, Cambridge University Press, 2005

ENME803107- APLIKASI CFD (4 SKS)**Tujuan Pembelajaran:**

Memahami prinsip dasar CFD dan memiliki pengetahuan dasar dalam mengaplikasikan CFD (Computational Fluid Dynamic)

Silabus:

Kaidah-kaidah Prediksi, Solusi Numerik: 'Advantages' dan 'Disadvantages'; Deskripsi Matematik Fenomena Fisik; Sifat dasar (nature) koordinat; Metoda diskritisasi; Aplikasi Volume-Atur Pada Persoalan Konduksi Panas; Konveksi dan Difusi; Persamaan diskritisasi dua dimensi; Persamaan diskritisasi tiga dimensi; Kebutuhan akan prosedur khusus; Beberapa kendala yang berhubungan dengan Representasi suku pressure-gradient, Representasi persamaan kontinuitas; Stayered Grid; Algoritma SIMPLE;

Revisi algoritma SIMPLER; Penyelesaian Akhir: Sifat dasar process iteratif prosedur numerik- Linierisasi sourceterm, Geometri-geometri ireguler, tips untuk persiapan program komputer dan pengujian.

Prasyarat: Tidak Ada

Buku Ajar:

1. Suhas V. Patankar, 1980, Numerical Heat Transfer and Fluid Flow, McGraw Hill.
2. C.A.J. Fletcher, 1996, Computational Techniques for Fluid Dynamics, 2nd edition, Springer Verlag
3. A.D. Gosman et al., 1985, COMPUTER AIDED ENGINEERING Heat Transfer dan Fluid Flow, John Wiley & Sons.

ENME803108 - TEKNIK REFRIJERASI (4 SKS)

Tujuan Pembelajaran:

Kuliah Teknik Pendingin memberikan kompetensidasar untuk melakukan simulasi dengansoftware untuk merancang sistem mesin pendinginan perlengkapannya dengan melibatkanhubungan yang sangat erat dengan Industridan pengguna Teknik Pendingin sehingga padaakhirnya mahasiswa mempunyai pemahamandalam rancangan bangun mesin pendingin sertamampu mengevaluasi dan menganalisis unjukkerjanya, terutama pada cold storage.

Silabus:

Prinsip Refrigerasi dan Heat Pump, Terminologidan Unit Satuan; Mesin refrigerasi sistem kompressiuap mekanis; Perpindahan Kalor dalam sistem Pendingin; Perhitungan p-h DiagramSiklus Refrigerasi; Refrigeran, Minyak Pelumas,Garam dan Lingkungan; Kompresor; Kondenserdan Evaporator; Sistem Pemipaan Refrigerasi& Perlengkapan; Peralatan Kontrol Automaticdan Perlatan Keselamatan; Sifat sifat Udara,Psychrometric dan Prosesnya; Mesin refrigerasiabsorpsi; Siklus pendingin alternative (adsorption,kompresi gas dan ejektor); Display Case,Cold Storage dan Prefabricated Cold Storage;Perhitungan Cold Room.

Prasyarat: Termodinamika Dasar

Buku Ajar:

1. ASHRAE Handbook of Fundamental,ASHRAE Atlanta, 1995.
2. Kuehn, Ramsey and Therkeld, ThermalEnvironmental Engineering, 3rd Edition,Prentice Hall, 1998.
3. Threkeld,JL., Thermal EnvironmentalEngineering, Prentice Hall.
4. ASHRAE Handbook of Fundamental,ASHRAE Atlanta, 20015. ASHRAE Handbook of Refrigeration,ASHRAE, Atlanta, 2002.

ENME803124 - AUDIT ENERGI (4 SKS)

Tujuan Pembelajaran:

Mata Kuliah ini berfokus pada teknik - teknik mengaudit energi pada sektor bangunan sehingga diharapkan mahasiswa mampu menganalisis rugi - rugi energi yang terjadi pada sistem yang diaudit serta dapat merekomendasikan peluang penghematan energi dalam sebuah laporan audit energi.

Silabus:

Energy Auditing Basics, Energy Accounting and Analysis, Understanding the Utility Bill, Energy Economics, Survey Instrumentation, The Building Envelope Audit, The Electrical System Audit, The Heating, Ventilating and Air-Conditioning Audit, Upgrading HVAC Systems for Energy Efficiency Verification of System Performance, Maintenance and Energy Audits, Self-Evaluation Checklists, World-class Energy Assessments, and Water Conservation

Buku Ajar:

1. Green Energy Audit of Buildings, A Guide for a Sustainable Energy Audit of Buildings, Giuliano Dall'O', Springer-Verlag London 2013

ENME803125 - ENERGI DAN LINGKUNGAN (4 SKS)

Tujuan Pembelajaran:

Kuliah ini memberikan pemahaman tentang dampak kerusakan lingkungan akibat pengolahan dan penggunaan energi serta penerapan langkah - langkah pencegahan dan perbaikan yang disesuaikan dengan proses industri modern.

Silabus:

Ecological principles & energy flow, environment concerns of energy extraction, energy use & climate change, environmental and ethic concerns, International treaties & convention on environmental mitigation. Teknologi lingkungan dan pencegahan polusi, perencanaan dan pengelolaan industri proses dalam rangka pencegahan bahaya kerusakan lingkungan, Process Safety, pemulihan energi dari limbah, pembangunan berkelanjutan, combustion and gas explosions, energi alternatif.

Prasyarat: -

Buku Ajar:

1. F.M. Vanek, L.D. Albright and L.T. Angenent. Energy Systems Engineering:Evaluation and Implementation, 2nd Edition. Mc. Graw Hill Companies, 2012.
2. Ristinen RA. Kaushaar JJ. Energy and the environment, 2nd edition, john wiley& sons, 2006
3. Banerjee BP. Handbook of energy and environment in India, Oxford University Press, 2005, India
4. MC.Dass, fundamentals of ecology, Tata McGraw Hill, 1994
5. Kaushik ND. Kaushik K. Energy, Ecology & Environment, Capital Publishing, 2004
6. De AK. Environmental Chemistry, New Age International Publishers, 2005

ENME803196 - PROPULSI JET DAN ROKET (4 SKS)

Tujuan Pembelajaran:

Silabus:

Buku Ajar:

ENME804109 - REKAYASA PENUKAR KALOR DAN MASSA (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran ini memberikan pemahaman mengenai alat penukar kalor yang banyak digunakan di seperti industri proses dan pembangkit daya sebagai aplikasi dari perpindahan kalor. Mata ajaran ini memberikan kompetensi dasar untuk mengenal tipe tipe utama heat exchanger dan mengetahui serta memilih tipe heat exchanger mana yang cocok untuk aplikasi yang ada. Memahami faktor dasar dalam merancang heat exchanger, mengestimasi ukuran dan harga heat exchanger serta mengetahui dan memahami tentang bagaimana perawatan heat exchanger.

Silabus:

Review Perpindahan Kalor, Jenis dan Aplikasi Alat Penukar Kalor; Desain Praktis Alat Penukar Kalor Jenis Shell and Tube (Thermal Dan Mekanikal); Estimasi Biaya Pembuatan; Alat Penukar Kalor; Operation and Monitoring Alat Penukar Kalor (Fouling And Vibration); Pemeliharaan Alat Penukar Kalor dan Korosi pada Alat Penukar Kalor; Pengenalan Software Aplikasi Desain Heat Exchanger; Tugas Presentasi atau Praktikum.

Prasyarat: Perpindahan Kalor dan Masa, Mekanika Fluida

Buku Ajar:

1. Frank P Incropera, David P De Witt, Fundamental heat and mass transfer, 7th Ed., John Wiley & Sons, 2011, New York
2. Holman JP, Heat Transfer, 10th, Mc Graw Hill, 2009.
3. Smith Eric, Thermal Design of Heat Exchanger, John Wiley & Sons, 1996, New York
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 6th Ed. John Wiley & Sons, 2014, New York.
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 7th Ed. Brooks/cole, 2010, USA
7. Rohsenow Warren, Hartnett James, Cho Young, Handbooks of Heat Transfer, 3rd Ed., Mc Graw Hill, 1998, New York.

ENME804110- TEKNIK PEMBAKARAN (4 SKS)**Tujuan Pembelajaran:**

Teknik Pembakaran Memberikan kompetensi dasar dalam menyelidiki, menganalisis serta mempelajari tentang proses pembakaran (combustion) bahan bakar (fuel), serta sifat dan kelakuan nyala api (flame). Kuliah Teknik Pembakaran memberikan pemahaman dasar untuk menerapkan hukum-hukum dasar aerothermochemistry dalam perhitungan rancang bangun praktis teknik pembakaran serta mampu menganalisis perilaku nyala dan mengembangkan pengetahuannya dalam bidang teknik pembakaran.

Silabus:

Arti Penting Kajian Pembakaran; Reaksi Dasar dan Stoikiometri Pembakaran; Bahan Bakar Gas (BBG); Bahan Bakar Cair; Bahan Bakar Padat; Dasar-dasar Termokimia dan Dinamika Fluida Pembakaran; Prinsip Kekekalan pada Aliran Bereaksi Kekekalan Massa Keseluruhan (Kontinuitas); Struktur Nyala Premixed Turbulen; Detonasi; Teknologi Pembakaran; Pembakaran Fixed-Bed, Suspensi, dan Fluidized-Bed; Aspek Kajian Nyala Api dan Teknologi Pembakaran; Temperatur Minimum Pengapian Sendiri (Auto/ Self-Ignitioan); Batas-batas Mampu-nyala; Penyebaran Kebakaran (Firespread), Bahan Pemadam Kebakaran, Pembakaran dan Lingkungan.

Prasyarat: Kimia, Termodinamika Dasar, Dasar Mekanika Fluida, Perpindahan Kalor dan Massa

Buku Ajar:

1. Turn, S.R., An Introduction to Combustion, 3rd Edition, McGraw-Hill, Inc. 2011
2. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.
3. Griffiths, J.F., and Barnard, J.A., Flame and Combustion, 3rd Edition, Blackie Academic and Professional, 1995.
4. Glassman, I., Combustion, 5th Edition, Academic Press, 2014.
5. Warnatz, J., Maas, U., and Dibble R.W., Combustion, 2nd Edition, Springer-Verlag, 1998.

ENME804111 - TEKNIK AERODINAMIKA (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran Teknik Aerodinamika merupakan terapan lanjut dari mekanika fluida yang secara umum menitik beratkan pada aplikasi-aplikasi aeronautika. Melalui mata ajaran ini diharapkan mahasiswa mampu memahami prinsip-prinsip fundamental dan persamaan-persamaan dasar aerodinamika dan menerapkannya dalam proses perancangan airfoil serta memahami karakteristik kinerja airfoil. Mahasiswa mampu memahami fenomena aliran tak mampu mampat melalui airfoil dan sayap terhingga (finite wings). Mahasiswa memiliki pemahaman fenomena aliran mampu mampat subsonic dan supersonik melalui aerofoil serta fenomena-fenomena aliran mampu mampat lainnya.

Silabus:

Konsep-Konsep Pengantar; Beberapa Prinsip-Prinsip dan Persamaan Dasar; Aliran Tak Mampu Mampat; Karakteristik Aerodinamika dari Airfoil; Sayap Terhingga; Aliran Tak Mampu Mampat Melalui Airfoil; Aliran Tak Mampu Mampat Melewati Sayap Terhingga; Airfoil Dalam Aliran Mampu Mampat; Sayap dan Kombinasi Sayap-Badan Dalam Aliran Mampu Mampat; Perancangan Airfoil; Permukaan Berganda; Vortex Lift; Aliran Sekunder dan Efek Viskos; Beberapa Fenomena Aliran Mampu Mampat Lainnya; Gelombang Kejut Normal; Gelombang Kejut Oblique; Gelombang Ekspansi; Aliran Supersonik.

Prasyarat: Mekanika Fluida, Termodinamika Dasar

Buku Ajar:

1. A.M. Kuethe and C.Y. Chow, Foundations of Aerodynamics, 5th Edition, John Wiley & Sons, Inc., 2009.
2. B.W. McCormick, Aerodynamics, Aeronautics, and Flight Mechanics, 6th Edition, John Wiley & Sons, Inc., 2010.
3. J Anderson, Fundamentals of Aerodynamics, 5th Edition, McGraw Hill, 2011.

ENME804112 - MESIN - MESIN TURBO (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa memahami berbagai jenis konstruksi tubin gas dan uap, beserta karakteristiknya dan kinerjanya, termasuk peralatan pendukungnya.

Silabus:

Karakteristik dan jenis turbin uap dan gas terhadap daya output yang dihasilkan, perhitungan kinerjanya, power-improvement nya, kinerja condenser, combined cycle plant, etc. Perlu mempelajari sistim getaran dalam konstruksi turbin.

Buku Ajar:

1. Thermische Stroomung Machine by Traupel

ENME801113 - SISTEM VENTILASI DAN TATA UDARA (4 SKS)**Tujuan Pembelajaran :**

Mata ajaran ini membekali mahasiswa pemahaman dan kompetensi perancangan sistem tata udara dengan meningkatnya kebutuhan akan kualitas udara yang baik. Mengingat akhir-akhir ini maka diperlukan pengetahuan yang lebih terhadap sistem tata udara seperti aspek tentang masalah-masalah kecepatan aliran udara didalam ruangan, kebisingan, odor, yang semuanya ini tercakup dalam Indoor Air Quality (IAQ). Pada mata ajaran ini akan diberikan juga pemahaman tentang jenis-jenis refrigerant yang ozon friendly termasuk didalam teknis pelaksanaan retrofit sistem tata udara.

Silabus :

Pengetahuan Sistem Tata Udara: Air Cooled dan Water Cooled Chiller, Packaged Unit, Direct Expansion dan Split Unit; Basic VAC Calculation : Design Condition, Load Estimating, Cooling Load; Sistem Ventilasi : Air Changes, Outdoor Air Requirement, Indoor Air Quality. Clean Space dan Air Filter System pada Industri dan Rumah Sakit; Sistem distribusi: Metode Equal Friction dan Static Regain, Duct and Piping Sizing; Komponen-Komponen Mesin Tata Udara : Chiller, Cooling Tower, Fan, Sistem AC dan AHU; Sistem Kontrol di gedung.

Prasyarat:**Buku ajar :**

1. Ronald Howell, Harry J.Sauer, Jr and William J.Coad : Principles of HVAC, ASHRAE 1998.
2. Carrier : Handbook of HVAC
3. ASHRAE Standard
4. Overseas Vocational Training Association Employment Promotion Corporation : Fundamentals of refrigeration and Air Conditioning.

ENME801129 - TERMOFLUIDA DAN RADIASI (2 SKS)**Tujuan Pembelajaran:**

Mahasiswa memahami dan mampu melakukan implementasi pengetahuan akan mekanika fluida dan perpindahan panas konveksi dan radiasi untuk menjelaskan dan menganalisis fenomena kebakaran dan dampaknya pada lingkungan.

Silabus:

Merupakan Mata Kuliah yang membahas mengenai pengetahuan ilmiah akan termofluida, fenomena perpindahan panas akibat konveksi dan radiasi, fenomena-fenomena melingkupi termofluida dan radiasi pada berbagai bentuk pembakaran seperti smoldering, pool fire, gasifikasi, serta pembentukan dan proses terjadinya radiasi yang berubah mencapai penyalaaan api.

Buku Ajar:

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. Munson, B.R., Fundamentals of Fluid Mechanics 4th Ed, John Wiley & Sons, Inc. 2000
3. Frank P Incropera, 1. David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
4. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
5. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.

ENME801130 - PENGANTAR DINAMIKA API (2 SKS)**Tujuan Pembelajaran:**

Mahasiswa memahami dasar dan parameter-parameter penting dalam proses terjadinya kebakaran (fire), fenomena dinamika api serta bahaya kebakaran (fire hazards).

Silabus:

Hukum-hukum dasar aerothermochemistry seperti termodinamika pembakaran, mekanika fluida, perpindahan kalor, reaksi kimia pembakaran dalam perhitungan dinamika api. Mahasiswa dapat melakukan kegiatan eksperimental di laboratorium untuk memahami perilaku dinamika api, dengan peralatan yang tersedia, seperti fenomena nyala premixed dan non-premixed, ignition, pembakaran padatan dan cairan, pembentukan plumes dan produksi asap.

Buku Ajar:

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Kuo., K., Principles of Combustion, John Wiley & Sons Ltd, 1986.
5. Turn, S.R., An Introduction to Combustion 2nd Edition, McGraw-Hill, Inc. 2000.

ENME802131- SISTEM PROTEKSI KEBAKARAN (2 SKS)**Tujuan Pembelajaran:**

Mahasiswa mampu memahami sistem perlindungan kebakaran baik yang bersifat pasif dan aktif.

Silabus:

Kompartemenisasi kebakaran, Strategi proteksi kebakaran pasif, sistem ventilasi natural untuk pengendalian asap dan panas akibat kebakaran, material tahan api dan instalasinya, integrasi sistem proteksi kebakaran otomatis untuk strategi proteksi kebakaran pasif, perancangan sistem proteksi kebakaran pasif, pemodelan kebakaran untuk perancangan sistem proteksi pasif. Pada mata kuliah ini akan dipelajari berbagai fenomena fisik maupun kimiawi yang relevan dengan berbagai piranti keras maupun lunak suatu sistem perlindungan kebakaran seperti sprinkler otomatis, agent berbentuk gas, sistem foam dan bubuk kimia. Sistem instalasi perlindungan kebakaran sesuai standar yang berlaku. Material tahan api dan instalasinya.

Buku Ajar:

1. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
2. Fire Protection Association, Passive Fire Protection Handbook, 2011
3. Tawarson A, Khan MM (1991) The Role of Active and Passive Fire Protection Techniques in Fire Control, Suppression and Extinguishment. Fire Safety Science 3:1007-1017. doi:10.3801/IAFSS.FSS.3-1007
4. Jurnal dan standar terkait

ENME802131- SISTEM MEKANIKAL DAN ELEKTRIKAL GEDUNG (2 SKS)**Tujuan Pembelajaran:**

Sistem Mekanikal Gedung adalah mata ajar yang memberi keahlian peminatan dan pemahaman tentang sistem sistem mekanikal yang terdapat pada gedung gedung modern yang makin meningkat tuntutannya dari segi kecanggihan, efisiensi, penggunaan energi yang lebih hemat.

Silabus:

Sistem Mekanikal Gedung secara Umum; Sistem Plumbing: SNI, Perhitungan, Pengolahan Air Kotor; Sistem Energi dalam Gedung; Building Automation System; Fire Fighting Systems: Hydrant dan Sprinkler System; Lift dan Escalator: Tipe-Tipe Lift, Round Trip Time, Handling Capacity, Waiting Time, Instalasi dan Control Sistem; Tipe Tipe Escalator, Aplikasi dan Instalasi.

Buku Ajar:

1. Mechanical System for Building.
2. Handbook of HVAC.
3. ASHRAE Journal
4. NFPA
5. Mechanical Installation in Building.
6. SNI Plumbing
7. SNI Hydrant, Sprinkler dan APAR.

ENME801121 - SISTEM MANAJEMEN ENERGI (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa mampu memahami konsep, analisa dan strategi perbaikan secara berkelanjutan kinerja energi dengan menerapkan manajemen energi yang efektif dalam praktek dan proses energy sesuai dengan standar dan aturan lokal maupun internasional serta penggunaan peralatan teknik yang terkait.

Silabus:

Pendahuluan, Kebijakan Energi, Rencana Energi, Implementasi dan operasi sistem manajemen energi, Penyiapan Manajemen Energi Organisasi, Perencanaan, pelaksanaan dan Evaluasi Manajemen Energi, Tinjauan Manajemen Energi, perangkat lunak pada sistem manajemen energi, studi kasus

Buku Ajar:

1. Energy management handbook / by Wayne C. Turner & Steve Doty ©2007 by The Fairmont Press, Inc
2. Guide to energy management by Barney L. Capehart, Wayne C. Turner, William J. Kennedy--Fifth Edition--International Version ©2008 by The Fairmont Press.
3. Effective implementation of an ISO 50001 energy management system (EnMS) / Marvin T. Howell. American Society for Quality, Quality Press, Milwaukee 53203 © 2014

ENME803133 - TUGAS PERENCANAAN SISTEM UTILITAS BANGUNAN GEDUNG (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa mampu menggunakan dan menerapkan konsep perancangan sistem utilitas bangunan gedung yang mencakup sistem ventilasi dan tata udara, plumbing, proteksi kebakaran, dan pengolahan air kotor.

Silabus:

Berupa tugas merancang sistem utilitas suatu bangunan gedung bertingkat.

Buku Ajar:

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME803134 - DINAMIKA API DALAM RUANG DAN PEMODELAN (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa dapat melakukan perhitungan dan menganalisis perilaku nyala dan dinamika api di dalam ruangan.

Silabus:

Nyala premixed dan non-premixed, ignition, pembakaran padatan dan cairan, pembentukan plumes dan produksi asap. pemodelan kebakaran dengan mempergunakan piranti lunak, perilaku api dalam kompartemen, kondisi sebelum dan sesudah flash over, laju produksi kalor dan produksi asap. Pemodelan penjalaran api. Piranti lunak yang akan digunakan untuk pemodelan diantaranya adalah Fire Dynamic Simulator dan Smokeview (NIST).

Buku Ajar:

1. Dougal Dysdale, An Introduction to Fire Dynamics, 3rd Edition, John Wiley and Sons, 2011.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Thierry POINSOT, Denis VEYNANTE, Theoretical and Numerical Combustion.

ENME803115 - SISTEM RUANG BERSIH (4 SKS)**Tujuan Pembelajaran:**

Memberi pemahaman pengetahuan dasar sistem ruang bersih dan penerapannya pada bangunan gedung, rumah saki serta industri farmasi. Pemahaman akan konsep kebersihan udara, sistem ventilasi dan pertukaran udara segar, aplikasi laminar flow, tekanan udara dalam ruang serta sistem pengukuran, validasi dan pengendalian akan diberikan secara detail.

Silabus:

Indoor environment: human psychological and physiological aspects, BEAM IAQ assessment; Air quality: air cleanliness, ambient air quality, rationale for standards; Indoor air pollutants: gaseous pollutants, airborne particulate, VOCs, radon, biological contaminants; Indoor air movement: air flow in confined and unconfined spaces, filtration systems; Instrumentation and measurement techniques; Control measures: improved IAQ by HVAC system design, removal of contaminants.

Prasyarat: -**Buku Ajar:**

1. ASHRAE : HVAC Design Manual for Hospitals and Clinics Second Edition, 2013
2. W. Whyte, Clean Room Technology Fundamentals of Design, Testing and Operation, John Wiley & Sons Ltd., 2001
3. John D. Spengler, J.M.Samet, J.F McCarthy, Indoor Air Quality Handbook, McGrawHill, 2001.

ENME803116 - SISTEM PLAMBING DAN STP (4 SKS)**Tujuan Pembelajaran:**

Sistem Plambing adalah mata ajarann yang memberi keahlian peminatan dan pemahaman tentang sistem sistem plambing yang terdapat pada bangunan gedung modern yang makin meningkat tuntutananya dari segi kecanggihan, efisiensi, penggunaan energi yang lebih hemat.

Silabus:

Sistem plambing secara umum, perhitungan kebutuhan air bersih dan air panas, tangki air, unit alat plambing, pompa, aplikasi water hammer, sistem pengolahan air kotor. Akan diberikan pemahan tentang sistem plambing air bersih untuk bangunan bertingkat banyak dan sistem pembuangan air kotor dan kotoran serta efek tekanan busa.

Prasyarat: -**Buku Ajar:**

1. Soufyan M. Noerbambang, Takeo Morimura, "Perancangan dan Pemeliharaan Sistem Plambing", Pradnya Paramita, 2009.
2. Louis S.Nielsen, "Standard Plumbing Engineering Design", McGraw-Hill, 1982,
3. IPC, "International Plumbing Code", International Code Council, 2009.
4. ASPE, "Plumbing Engineering Design Handbook- Volume 1 & 2", ASPE, 2004.
5. B.B. Sharp & D.B Sharp, "Water Hammer - Practical Solutions", Butterworth Heinemann, 2003.
6. Metcalf & Eddy, "Wastewater Engineering - Treatment and Reuse", McGraw-Hill Co.,2003.
7. Shun Dar Lin, "Water and Wastewater Calculation Manual", McGraw-Hill, 2007.
8. Michael Frankel, CPD, "Facility Piping Systems Handbook - For Industrial, Commercial, and Healthcare Facilities", McGraw-Hill, 2010.
9. 2012 Uniform Plumbing Code, IAPMO 2012

ENME803117 - ASESMEN LINGKUNGAN BANGUNAN GEDUNG (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa dibekali dengan pemahaman untuk meningkatkan kesadaran akan masalah lingkungan dan dampak bangunan gedung terhadap lingkungan serta dapat mengevaluasi kemampuan bangunan baru dan yang eksisting untuk memenuhi berbagai kriteria kinerja lingkungan.

Silabus:

Global issues: electrical loading and equivalent CO2 production, ozone depletion and global warming, abusive use of natural resources; Local issues: demand of electricity, use of water, wastewater discharge, recycled material, local environmental impact; Building environmental assessment methods; Assessment of energy use; Energy audit; Indoor issues: indoor environmental quality factors, current legislation and standards; Pollutants in buildings; Indoor air quality; Health and safety; Safety audit; Health audit.

Prasyarat: -

Buku Ajar:

1. Energy-Efficient Building Systems Green Strategies for Operation and Maintenance, Dr. Lal Jayamaha, McGraw-Hill, 2006.
2. Bradon, S.P., and Lombardi, P., (2005) Evaluating Sustainable Development in the Built Environment, Blackwell Science Ltd., Oxford.
3. An Environmental Assessment for Existing Building Developments. Version 5/03, May 2003
4. An Environmental Assessment for New Building Developments. Version 4/03, May 2003
5. Energy audit of building systems : An engineering approach, Moncef Krarti, 2nd edition, CRC Press Taylor & Francis Group, 2011

ENME803135 - TEKNIK DAN STRATEGI PEMADAMAN KEBAKARAN (4 SKS)**Tujuan Pembelajaran:**

Mata kuliah ini akan memberikan pengetahuan ilmiah dan praktis untuk segala aspek teknik dan strategi memadamkan sumber api secara efektif.

Silabus:

Forcible Entry, Teknik Pemadaman Api (melingkupi jenis-jenis material pemadam), Fire Fighting of High Rise Building, Safe Work at Heights, Compartment Fires and Tactical Ventilation, serta Komunikasi dan Mobilisasi Petugas Pemadam.

Buku Ajar:

1. Delmar Cengage Learning, Firefighter's Handbook: Essentials of Firefighting and Emergency Response 2nd edition, ISBN-13: 978-1401835750, Delmar Thomson Learning, 2004
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME803136 - MANAJEMEN KESELAMATAN KEBAKARAN PADA BANGUNAN (4 SKS)**Tujuan Pembelajaran:**

Mata kuliah ini akan memberikan pengetahuan ilmiah mengenai segala aspek Manajemen Keselamatan pada Bangunan.

Silabus:

Fire Safety Mangement, Identifikasi Bahaya Kebakaran, Menyusun Rencana Kegiatan, Struktur Organisasi dan Pembinaan SDM, serta Pengawasan dan Pencegahan Kebakaran pada Bangunan.

Buku Ajar:

1. Daniel E. Della-Giustina, Fire Safety Management Handbook, CRC Press, 2014
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME804118 - PERANCANGAN SISTEM MEKANIKAL BANGUNAN GEDUNG (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran ini membekali mahasiswa pemahaman dan kompetensi dasar perancangan sistem mekanikal bangunan gedung yang mencakup sistem ventilasi dan tata udara, plambing, proteksi kebakaran, dan pengolahan air kotor

Silabus:

Berupa tugas merancang sistem utilitas suatu bangunan gedung bertingkat.

Buku Ajar:

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME804119 - AKUSTIK (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman konsep dasar akustik, sistem akustik dalam bangunan gedung serta konsep pengendalian rambatan suara dalam sistem ventilasi dan tata udara.

Silabus:

Acoustic fundamentals: fundamental properties of sound and waves, sound propagation and transmission inside buildings and in air ducts; Acoustic design and planning: requirements for auditoria, lecture theatres, plant rooms and etc., directional and spacial impression, reverberation, echo, silencers, active noise control; Environment impact and local legislation; Vibration: acoustically driven vibration, control and transmission; Problem investigations: noise and vibration measurement, data analysis techniques, software packages.

Buku Ajar:

1. Acoustic Noise Measurement. J. R. Hassall (1979).
2. An Environmental Assessment for Existing Office Buildings. BRE (1993).
3. CIBSE Guide B12 Sound Control (1976).
4. Concert Halls and Theatres: How they sound. L. L. Beranek (1996).
5. Engineering Principles of Acoustics. D. D. Reynolds (1981).
6. Fundamentals of Acoustics. L. E. Kinsler, A. R. Frey, A. B. Coppens and J. V. Sanders (1982).

7. Handbook of Acoustics, M.J. Crocker, Wiley (1998).
8. ASHRAE HVAC System and Equipment, ASHRAE Atlanta, 2012
9. Noise Control in Building Services. A. Fry (1988).

ENME804120 - MANAJEMEN PEMELIHARAAN UTILITAS BANGUNAN GEDUNG (4 SKS)**Tujuan Pembelajaran:**

Setelah mengikuti mata kuliah ini mahasiswa paham akan peranan strategis pemeliharaan bangunan gedung berdasarkan kebutuhan untuk pengelolaan pemeliharaan aset yang dibangun yang meliputi penilaian kebutuhan, perencanaan dan prioritas, penganggaran dan sistem informasi yang memadai.

Silabus:

Introduction, Scoping of Maintenance Function and Demand in Buildings, Essentials of Built Assets Maintenance Management, Assignment: Contemporary Issues in Asset Maintenance Management, Seminars/workshops

Buku Ajar:

1. Armstrong, J. & Saville, A. (2005). Managing your building services, The Chartered Institution of Building Services Engineers, London.
2. Harris, J. & Hastings, P. (2004). Business-focussed maintenance, BSRIA Publications.
3. Canter, B. & Swallow P. (1996). Building Maintenance Management, Blackwell Science. (ISBN: 0-632-03419-X)
4. Wood, B. (2003). Building Care. Blackwell Publishing. UK. (ISBN 0-632-06049-2)
5. Wordsworth, P. (2001). Lee's Building Maintenance Management, 4th Ed., Blackwell Science, UK. (ISBN 0-632-05362-3)
6. Building Services Handbook, Sixth edition, Fred Hall and Roger Greeno, Butterworth-Heinemann, 2011
7. ASHRAE Guideline 0-2005, The Commissioning Process

ENME804137 - TEKNIK INVESTIGASI KEBAKARAN (4 SKS)**Tujuan Pembelajaran:**

Mata kuliah Teknik Investigasi Kebakaran akan memberikan pemahaman dan pengetahuan ilmiah mengenai investigasi kebakaran dalam ruang lingkup legislatif mengenai keselamatan kebakaran yang berlaku.

Silabus:

Pembelajaran dilakukan dengan elemen-elemen ilmu yang berlaku, diantaranya : Compartment Fires, Flame Spread, Forensic Science, Laboratory Analytical Techniques, Pemodelan untuk membantu investigasi, dan studi kasus mengenai kebakaran.

Buku Ajar:

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME804138 - EVALUASI DAN PEMELIHARAAN SISTEM PROTEKSI KEBAKARAN (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa dapat melakukan evaluasi kinerja system proteksi kebakaran dan mengetahui serta mampu merencanakan pemeliharaan system proteksi kebakaran.

Silabus:

Mata kuliah ini akan memberikan teknik evaluasi kinerja dari sistem perlindungan kebakaran yang digunakan dalam berbagai jenis gedung dan teknik penyusunan rencana manajemen untuk pengambilan keputusan. Sistem perlindungan kebakaran akan diuraikan kedalam elemen-elemen sehingga dapat dilakukan evaluasi kuantitative menggunakan berbagai jenis kajian kebakaran.

Prasyarat: Tidak Ada**Buku Ajar:**

1. Dougal Drysdale, An Introduction to Fire Dynamics 3rd Edition, John Wiley and Sons, 2011.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Rasbach, D.J., et al., Evaluation of Fire Safety, John Wiley and Sons, 2004.
4. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
5. SNI, ASTM, NFPA, rules and standards

ENME804139 - PROTEKSI KEBAKARAN DI INDUSTRI PROSES (4 SKS)**Tujuan Pembelajaran:**

Mata Kuliah ini akan memberikan pemahaman dan pengetahuan ilmiah mengenai sistem proteksi kebakaran pada industri proses.

Silabus:

Identifikasi Bahaya Kebakaran pada Industri, Standard dan Hukum yang berlaku, Proteksi Kebakaran di Industri Proses, Perencanaan Evakuasi dan Mitigasi, serta Pemodelan untuk Prediksi Bahaya Kebakaran pada Industri Proses.

Buku Ajar:

1. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME801140 - MATERIAL DAN PROSES MANUFAKTUR (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman dan kompetensi mengenai berbagai jenis material untuk rekayasa, karakteristik material yang dibu-

tuhkan untuk perancangan dan proses manufaktur, proses manufaktur produk, metode pemilihan proses manufaktur, sehingga memiliki pemahaman yang utuh dalam pemetaan dan keterhubungan antara jenis dan karakteristik material, faktor perancangan dan proses manufakturnya.

Silabus:

Material untuk Rekayasa; Karakteristik dan Karakterisasi Material; Proses - Proses Manufaktur; Material Pakai Ulang dan Metode Pemurnian Material; Karakteristik dan Metode Pemilihan Material untuk Proses Manufaktur. Metode Pemilihan Proses Manufaktur (Proses, Akurasi, Ekonomi); Tugas Pemetaan Material dan Proses Manufaktur terhadap Fungsi Suatu Produk.

Buku Ajar:

1. Michael Ashby dan Kara Jhonson, *Materials and Design : Arts and science in material selection in product design*, Butterworth-Heinemann, 2002
2. Michael Ashby, *Material selection in Mechanical Design*, Butterworth Heinemann, 2005
3. John A. Schey, *Introduction to Manufacturing Processes*, McGraw-Hill, 1999
4. Degarmo, E. Paul, *Materials and Processes in Manufacturing*, Prentice Hall Int. Inc, 8th edition, 2005

ENME801141 - METODOLOGI PERANCANGAN DAN PENGEMBANGAN PRODUK (4 SKS)

Tujuan Pembelajaran:

Memberikan pemahaman dan penguasaan teori dan metodologi perancangan dan pengembangan produk meliputi : perencanaan, pengembangan konsep, perancangan sistem, perancangan rinci, pengujian dan penyaringan, production ramp-up, dalam rangkaian mempertimbangkan keseluruhan faktor pengembangan produk..

Silabus:

Perencanaan Produk; Metode Identifikasi Kebutuhan; Metode Pemilihan Produk (Feasibility Study); Spesifikasi Bisnis; Pengembangan dan Pemilihan Konsep; Aspek Rekayasa Dalam Pengembangan dan Manufaktur Produk (Proses, Material, Termal, Durabilitas); Aspek Non-Teknis Dalam Pengembangan dan Manufaktur Produk; Dasar Perancangan untuk Manufaktur dan Perakitan; Perhitungan Ekonomi Pengembangan Produk.

Buku Ajar:

1. Karl T. Ulrich. *Product Design and Development*, 3rd edition, Mc.Graw Hill 2004.
2. Dieter, G.E., *Engineering Design*, 3rd edition, Mc.Graw Hill 2000

ENME802142 - INTEGRASI TEKNOLOGI PERANCANGAN DAN MANUFaktur (4 SKS)

Tujuan Pembelajaran:

Memberikan pemahaman kompetensi dan kemampuan dalam melakukan proses perancangan dan manufaktur dengan memanfaatkan teknologi perancangan / desain dan manufaktur terkini mencakup pada sistem CAD / CAM dan rekayasa balik dan pengembangan prototipe untuk meningkatkan efisiensi dan mempercepat proses produksi, mengurangi kesalahan, meningkatkan kualitas dan mengurangi biaya produksi.

Silabus:

Tinjauan Umum Sistem CAD / CAM; Piranti Keras dan Lunak Sistem CAD / CAM; *Geometric Modelling* : Tipe dan Representasi matematis model kurva, surface dan solid 3D; Metode pemodelan dan manipulasi model 3D; Pertukaran Data dalam dan antar sistem CAD / CAM; Praktikum CAD; Teknologi CNC; Metode *Tool Path Generation* dalam sistem CAM; Pengendalian kualitas hasil pemesinan dalam sistem CAM; *Computer Aided Process Planning - CAPP*; *Postprocessing*; Praktikum CAM; Pengukuran geometri 3D; Prinsip dan Pengukuran berbasis *Coordinate Measuring Machine (CMM)*; Metode Filtrasi Data; Identifikasi Batas Fitur; Pemodelan dan Manipulasi model 3D berbasis titik; Modularisasi model 3D untuk Prototipe, Metode Prototipe dan *Rapid Prototyping*, diskritisasi model, prinsip dan aplikasi SLS dan SLM.

Buku Ajar:

1. Kunwoo Lee, *Principles of CAD / CAM / CAE*, Prentice Hall, 2003
2. Gandjar K, *Hand out CAD/ CAM*, DTMUI, 2007
3. Connie L. Doston, *Fundamentals of Dimensional Metrology*, Delmar Learning, 2006
4. Ali K. Kamrani. Emad A Nasr, *Rapid Prototyping : Theory And Practice*, Birkhauser, 2006
5. Patri K. Venivinod, Weyin Ma, *Rapid Prototyping : Laser Based and Other Technologies*, 2003.

ENME803143 - KEGAGALAN MEKANIKAL (4 SKS)

Tujuan Pembelajaran:

Mata ajaran ini memberikan pemahaman dan kompetensi mengenai prinsip dan mode-mode kegagalan mekanikal yang mungkin terjadi dan harus dihindari sehingga harus diperhitungkan dalam perancangan mekanikal, yang meliputi buckling, corrosion, fatigue, creep, melting, fracture, thermal, dan wear.

Silabus:

Teori dan Mode Buckling (Lateral-Torsional, Plastic, Dynamic), Teori dan Modus Korosi (Metal, Non-Metal, Glass); Pencegahan Korosi; Teori dan Modus Kegagalan Fatigue; Teori dan Modus Creep; Teori dan Mode Melting; Teori dan Modus Tipe Fracture; Teori dan Modus Kegagalan Termal; Teori dan Modus Wear; Analisa Kegagalan dan Pencegahan terhadap: Buckling, Corrosion, Fatigue, Creep, Melting, Fracture, Thermal, dan Wear.

Buku Ajar:

1. Jack A Collins, *Materials Failure in Mechanical Design*, Wiley - Interscience, 1993
2. S. Suresh, *Fatigue of Materials*, Cambridge University Press, 1998

3. M Jansenn, J. Zuidema, Fracture Mechanics, VSSD, 2006
4. Arthur J. McEvily, Metal Failures : Mechanisms, Analysis and Prevention, 2013

ENME803144 - DINAMIKA SISTEM MEKANIKAL (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman dan kompetensi mengenai prinsip dan metode analisis dinamika system mekanikal sebagai pertimbangan penting dalam proses perancangan untuk menghasilkan system mekanikal yang memiliki resistansi dinamik yang lebih baik dan juga memahami berbagai dampak yang diberikan akibat adanya interaksi antara sistem mekanikal

Silabus:

Sistem Kinematika: Teori dan Prinsip system Dinamika: Metode Pemodelan Dinamik: Diagram Blok dan Model Variabel Keadaan: Analisis Sistem Spasial - Temporal: Analisis Sistem Spasial - Frekuensi; Vibrasi; Stabilitas: Kesetimbangan Dinamik: Analisis Dinamika Komponen Mekanikal: Analisis dan Pemodelan: Sistem Kontrol.

Buku Ajar:

1. Palm, Modelling, Analysis, and Control of Dynamic Systems, Wiley, 2006
2. Harold Joseph dan Ronald Huston, Dynamic of Mechanical System, CRC, 2002
3. Palm, System Dynamics, McGraw-Hill, 2007
4. Chapman, Stephen J., Essentials of Matlab Programming, Thomson Nelson, 2006

ENME803145 - PENGEMBANGAN PRODUK KOMPOSIT (4 SKS)**Tujuan Pembelajaran:**

Memberikan kompetensi dan keahlian peminatan kepada mahasiswa dalam bidang perancangan dan fabrikasi komponen/konstruksi mekanikal dari bahan komposit. Mata ajaran ini memberikan pemahaman tentang material komposit termasuk didalamnya karakteristik, pengujian, proses manufaktur, dan aplikasi khusus di bidang rekayasa.

Silabus:

Tipe Komposit, Material, Sifat, dan Mekanika; Pengetahuan dan Karakteristik Serat Komposit; Kekuatan, Kekerasan, dan Ekspansi Termal Komposit; Teori Kombinasi Serat dan Matriks; Karakterisasi Matriks Komposit; Teori Lamina On Axis dan Off Axis; Desain Produk Komposit; Teknik Fabrikasi Komposit; Metode Pengetesan; Future Applications.

Buku Ajar:

1. Brent Strong, Fundamentals Of Composites Manufacturing: Materials, Methods and Applications - Technology & Engineering - 2007
2. By Daniel Gay, Suong V . Hoa, Stephen W. Tsai Translated by Stephen W Tsai Contributor Suong V. Hoa, Stephen W. Tsai, Composite materials: Design and application, 2nd: CRC Press 2007
3. Soemardi, T.P. Diktat Mekanika komposit, Fabrikasi dan Testing. FTUI. 2003.
4. Composites ASM handbook No 21

ENME803146 - FINITE ELEMENT DAN MULTIPHYSICS (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran teknologi multiphysics memberikan pemahaman dasar dan keahlian mengenai prinsip-prinsip pemodelan, teknik penyelesaian seperti 'finite element method' dan aplikasinya dalam kasus-kasus desain dan analisis enjiniring. Adapun model fisika yang dipelajari meliputi permasalahan dalam aspek Termal, Elastisitas (plates dan shells), Akustik, dan Elektromagnetis.

Silabus:

Pengenalan FEA (Finite Element Analysis); Fundamental FEA 1 (konsep-konsep dasar FEA dan formulasi Fea); Fundamental FEA 2 (Modus kegagalan, Analisis Dinamik, Kapabilitas FEA dan keterbatasannya); Dasar-dasar Pemodelan Finite Element, Pemodelan CAD untuk FEA; Membangun model Finite Element; Simulasi model dan Interpretasi hasil; Thermal-Structural; Pressure-Structural; Electromagnetic-Thermal Structural, Analisis Thermal Actuator; Proses Coating; Elemen-elemen Kunci Kesuksesan Implementasi Teknologi Multiphysics; Pengantar CFD dan Aplikasinya.

Buku Ajar:

1. William B J Zimmerman, Multiphysics Modeling with Finite Element Methods, World Scientific Publishing, 2006
2. Barry H V Topping, A. Bittner, Engineering Computational Technology, Civil Comp Press, Edinburgh, UK, 2002.
3. Indra Siswantara, Catatan Kuliah Teknologi Multiphysics, 2008

ENME803147 -PERANCANGAN DAN PENGEMBANGAN PRODUK EDUKASI (4 SKS)**Tujuan Pembelajaran:**

Memahami dasar-dasar dan proses perancangan dan pengembangan produk edukasi dalam industri alat peraga, produk edukasi, dan alat peraga permainan.

Silabus:

Brainstorming dan mengemukakan ide dan pendapat, Inovasi dan Pengembangan Tema, Basics of Toy Product Design, Dasar Perancangan Teknik dan Mekanikal, Teori Dasar Membuat Sketch, Proses Pemodelan Sketsa Gambar, Design Aesthetics, Teori Manufaktur dan Pemilihan Material untuk Alat Peraga Permainan, Teori Dasar Pembuatan Prototipe, Portofolio Design, Presentasi dan Idea Pitching.

Buku Ajar:

1. Karl Ulrich, Steven Eppinger, 2015, Product Design Development Flow, 6th Edition, McGraw Hill.
2. Donald A. Norman, 2005, Emotional Design, 1st Edition, Basic Books.
3. Michael Michalko, 2006, Thinkertoys : A Hanbook of Creative Thinking Techniques, 2nd Edition, Ten Speed Press.

ENME803161 - PROSES PERMESINAN MIKRO (4 SKS)

Tujuan Pembelajaran:

Mata ajaran ini memberikan keahlian peminatan terhadap proses fabrikasi mikro yang banyak dipakai pada pembuatan MEMS (micro electro mechanical system) saat ini yang memiliki penerapan luas pada sistim biomedis (biomedic system), sensor mikro dan peralatan elektronik (electronic devices). Mata ajaran fabrikasi mikro melingkupi pemahaman mengenai teknik fabrikasi beserta struktur mekanika dasar (basic structure mechanics) pada suatu produk mikro dan juga karakterisasi hasil proses fabrikasinya yang dilakukan di laboratorium.

Silabus:

Pengenalan Teknik Fabrikasi Mikro; Lithography: Aspek Perancangan, Pembuatan Masking, Teknik Etsa (Dry Etching Dan Wet Etching); Teknik Deposisi: Fisika dan Kimiawi; Electroplating, Micromolding, Proses menggunakan Sinar (Beam Processing); Penyesuaian Mikronisasi (Microscaling Consideration); Proses Perpindahan (Transport Processes) dan Ilmu Pengukuran (Metrology) dalam Lingkup Mikro; Aplikasi dan Praktikum,

Buku Ajar:

1. Madou, M.J., Fundamentals of Microfabrication : The Science of Miniaturization, CRC Press, 2002.
2. McGeough, J (Ed.), Micromachining of Engineering Materials, Marcel Dekker, 2002, ISBN 0-8247-0644-7
3. Mainsah, E., Greenwood J.A. and Chetwynd D.G., Metrology and Properties of Engineering Surfaces, Kluwer Academic Publ., 2010
4. Gardner J.W. and Hingle H.T. (Ed.) From Instrumentation to Nanotechnology, Gordon and Breach Science Publishers, 1991, ISBN 2-88124-794
5. Korvingk J.G. and Greiner A. Semiconductors for Micro and Nanotechnology - An Introduction for Engineers, Wiley - VCH GmbH, 2002, ISBN 3-527-30257-3.
6. Mark J. Jackson, Microfabrication and nanomanufacturing, Taylor&Francis, 2006

ENME804148 -PERANCANGAN UNTUK MANUFAKTUR DAN PERAKITAN (4 SKS)

Tujuan Pembelajaran:

Memberikan pengetahuan, pemahaman dan kompetensi dalam melakukan proses perancangan produk yang mempertimbangkan, memasukkan faktor dan berorientasi pada: material, kemudahan manufaktur (kemampu manufakturan/manufacturability) dan proses perakitanannya. Sehingga diharapkan produk yang dibuat memiliki kemudahan manufaktur dan perakitan.

Silabus:

Review pemilihan material dan proses, perancangan produk untuk perakitan manual, perancangan untuk perakitan otomatis, perancangan PCB untuk manufaktur dan perakitan, perancangan proses pemesian, injection molding, proses pembentukan logam lembaran, die-casting.

Buku Ajar:

1. Boothroyd, Product Design for Manufacture and Assembly, 3rd Edition, CRC Press, 2010

ENME804149 -KEBISINGAN DAN GETARAN (4 SKS)

Tujuan Pembelajaran:

Mata ajaran ini memberikan kompetensi kepada mahasiswa untuk menyelesaikan persoalan aplikasi getaran mekanis pada struktur konstruksi, pelat maupun bejana (vessel), kemudian melakukan perhitungan perancangan sistim peredam getaran, sistim dukungan mesin maupun penguat pada alat alat produksi. Hingga pada akhirnya mahasiswa memiliki pemahaman dasar untuk melakukan pengukuran getaran, prakiraan prediksi waktu kerusakan mesin, analisa data sinyal getaran dan spektrum getaran serta melakukan diagnosa kondisi kesehatan mesin berdasarkan analisa data data getaran dan data lainnya yang terkait.

Silabus:

Getaran Mekanis dengan Derajat Kebebasan Banyak; Getaran pada Struktur Konstruksi; Getaran pada Pelat dan Cangkang (Plate and Shell Vibration); Isolasi Getaran; Perancangan Peredam Getaran; Teknik Pengukuran Getaran; Analisa Spektrum Getaran; Diagnosa Kesehatan Mesin.

Buku Ajar :

1. Jerry H.G., "Mechanical and Structural Vibrations", John Wiley, 2004
2. Demeter G.F., "Mechanical and Structural Vibrations", John Wiley, 1995
3. Kenneth G.M., "Vibration Testing: Theory and practice 2nd ed", Wiley, 2008
4. Werner Soedel, "Vibrations of Shells and Plates", 3rd edition - revised and expanded, Marcel Dekker, INC., 2004
5. Randall R.B., "Frequency Analysis", Brüel & Kjær, 1987

ENME804162 - LASER ASSISTED PROCESS (4 SKS)

Tujuan Pembelajaran:

Mahasiswa dapat memahami ilmu yang terkait dengan proses fabrikasi yang dibantu dengan teknologi laser, dan aplikasi serta penerapan langsung dari proses fabrikasi yang dibantu oleh teknologi laser.

Silabus:

Dasar - Dasar Teknologi Manufaktur berbasis Laser; Proses Pembentukan dibantu Laser; proses *joining* dengan dibantu teknologi laser; *Laser Assisted Surface Engineering*; Jenis-Jenis Laser, Penerapan Teknologi Laser, Dasar- Dasar interaksi laser dengan material dan Klasifikasi Proses Material dengan Teknologi Laser.

Buku Ajar:

1. A.M. Hasofer, V.R. Beck, I.D. Bennetts, *Risk Analysis in Building Fire Safety Engineering*, Elsevier Butterworth-Heinemann, 2007.
2. Ralph W King and John Magid, *Industrial Hazard and Safety Handbook*, ISBN: 978-0-408-00304-9
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME801150 - MANAJEMEN SISTEM INFORMASI MANUFAKTUR (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman mengenai teori, metoda penerapan dan teknologi sistem informasi, pengelolaannya, konsep pengembangan sistem informasi berbasis pengetahuan (Knowledge Management System) dan mampu menerapkan dalam dunia industri manufaktur.

Silabus:

Pengantar Sistem Informasi; State of The Art Pemanfaatan Sistem Informasi; Teori dan metodologi Sistem; Database Management Systems; Desain Sistem 1 : Functionality Overview, Enabling Technology (Automated Solution Quality Assessment, Representasi Multi Data, Database dan Teknoogi XML); Desain System 2 : (Desain Database, Input Informasi, Output Informasi); Studi Kasus: Dokumentasi Terotomasi dan Sistem Reporting untuk Manufaktur; Pengantar Knowledge Base Engineering; Konsep-komsep dan Metodologi dalam KBE (Sistem Pakar, Neural Network); Aplikasi KBE.

Buku Ajar:

1. Raymond McLeod Jr., *Strategic information Management : Challenges and Strategies in Managing Information System*; 3rd Edition, Butterworth-Heinnemen, 2003.
2. Cortada, James. *Total Quality Management*, McGraw Hill Book Co.
3. Ake, Kevin et al. *Information Technology for Manufacturing : Reducing Costs and Expanding Capabilities*, CRC Press, 2003.
4. Cecelja, Franco, *Manufacturing Information and Data System : Analysis Design and Practice*, Butterworth-Heinnemen, 2001.

ENME801151- PROSES DAN SISTEM MANUFAKTUR (4 SKS)**Tujuan Pembelajaran:**

Kuliah proses dan sistem manufaktur diberikan dengan tujuan agar mahasiswa mengetahui dan mampu menerapkan teknologi proses manufaktur konvensional dan non-konvensional untuk pembuatan suatu produk dan parameter-parameter yang mempengaruhinya yang dikhususkan pada proses pembentukan logam, pemesinan, proses *rapid-prototyping*. Selain itu juga mengetahui, dan memahami sistem produksi yang ada di industri.

Silabus:

Memahami Material dalam Manufaktur; Teori dan Metode Proses *Casting* (Pengecoran Logam); Teori dan Metode Proses Pembentukan Bulk; Teori dan Metode Proses Pembentukan Material Lembaran (*Sheet Metal Forming*); Teori dan Metode Proses Metalurgi Serbuk (*Powder Metallurgy*); Teori dan Metode Proses Pemesinan/Pemotongan Material; Teori dan Metode Proses Peningkatan Kualitas Permukaan Produk; Konsep dan metode sistem manufaktur.

Buku Ajar:

1. Wagoner R., Chenot J.-L., *Fundamentals of Metal Forming*, John Wiley & Sons, Inc, 2003
2. Degarmo P., *Materials and Process in Manufacturing*, Prentice Hall, 2004
3. Schey J., *Introduction to Manufacturing Process*, McGraw-Hill, 2004
4. Thomas E Vollman, *Manufacturing Planning and Control*, McGraw Hill 1997
5. Stanley B. Gershwin, *Manufacturing System Engineering*, Prentice Hall, 1993
6. John M. Nicholas, *Competitive Manufacturing Management*, 1997

ENME802152 - OTOMASI DAN ROBOTIKA (4 SKS)**Tujuan Pembelajaran:**

Kuliah Otomasi dan Robotika membahas teknologi otomasi dan aplikasinya pada industri dan perancangan dan pengendalian Robot yang menekankan pada : pemahaman jenis-jenis sistem otomasi khususnya di industri manufaktur dan mekanisme, perancangan dan pengembangan sistem otomasi yang menekankan pada 3 hal : kehandalan, kualitas dan biaya serta pemahaman sistem pengendalian robot. Kuliah Otomasi dan Robotika diberikan dengan tujuan agar mahasiswa mempunyai pemahaman dalam penerapan teknologi Otomasi dan pengetahuan Robotika khususnya pada industri manufaktur.

Silabus:

Sistem Otomasi; Klasifikasi Jenis Otomasi Permesinan Manufaktur; Sistem Penggerak (Aktuator); Sistem Sensor; Sistem Kontrol PLC pada Otomasi Permesinan Manufaktur; Robotika: Definisi dan Prinsip Kerja Robot; Spatial Descriptions: Definisi dan Prinsip, Metoda dan Aplikasi Spatial descriptions; Forward Kinematics: Definisi, Prinsip dan Pemanfaatan Forward Kinematics; Jacobians: Kecepatan, Bentuk Eksplisit, Definisi dan Prinsip Inverse Kinematics; Dinamik: Bentuk Eksplisit, Akselerasi dan Inertia; Sistem Kendali Robot: PID control, Joint Space Control; Operational Space Control dan Force Control; Tugas Perancangan Robot.

Buku Ajar:

1. Craig J., *Introduction to Robotics*, AddisonWesley Publishing Inc., 1989.
2. Heath L., *Fundamentals of Robotics, Theory and Applications*, Prentice Hall, 1979.
3. Koren Y., *Robotics for Engineer*, McGrawHill, Intl Edition, 1985.
4. Lentz K. W. Jr., *Design of Automatic Machinery*, Van Nostrand Reinhold, 1985.
5. Schilling R. J., Mikell P., *Fundamentals of Robotics, Analysis and Control*, PrenticeHall, 2000.
6. Kiswanto G., *Otomasi dan Robotika*, DiklatKuliah Departemen Teknik Mesin, 2004.

ENME803153 - SISTEM MACHINE VISION (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran Machine Vision Industri memberikan pemahaman dan kompetensi mengenai prinsip, metode dan aplikasi pemantauan proses produksi berbasis visual dengan memanfaatkan teknologi kamera, pemrosesan imej, pengenalan fitur untuk keperluan : identifikasi produk, pemilihan dan pemilahan produk, dan pengendalian kualitas. Dengan selesainya mata ajaran ini, mahasiswa memiliki kemampuan dalam menerapkan dan mengembangkan metode pemantauan visual proses produksi bagi keperluan di industri.

Silabus:

Dasar Metode Machine Vision: Imej Biner, Morphologi Biner dan Gray-Scale, Analisa Tekstur; Metode Identifikasi Fitur; Metode Pemrosesan Imej Cerdas/Intelligent Image Processing (Sistem Prolog); Pengendalian Perangkat/Instrumen Antar Muka (Instrumen, Signal, Protokol, PLC); Metode Pengenalan Imej Berwarna; Aplikasi Machine Vision.

Buku Ajar:

1. J.R. Parker, Algorithms for Image Processing and Computer Vision 2nd ed, Wiley, 2010
2. Butchelor B. G., Whelan P. F., Intelligent Vision System for Industry, Springer, 2012
3. E.R. Davies, Machine Vision : Theory, Algorithm, Practicalities, Morgan Kauffman, 2004
4. Micheul S, Lawrence O’Gorman, Michael J S Practical Algorithms for Image Analysis : Description, Examples and Code, , Cambride Univ. Press, 2000
5. Rafael Gonzales, et.al, Digital Image Processing using Matlab, McGraw Hill, 2010.

ENME803154 - SISTEM MANAJEMEN PRODUKSI DAN MUTU (4 SKS)**Tujuan Pembelajaran:**

Memberikan pengetahuan, pemahaman dan kemampuan untuk melakukan pengelolaan, analisa dan perbaikan sistem produksi di industri manufaktur dengan prinsip efisiensi dan efektifitas, serta memahami dan mampu menerapkan dan mengembangkan kebijakan dan prosedur yang diperlukan untuk meningkatkan dan mengendalikan berbagai proses untuk meningkatkan kinerja industri.

Silabus:

Pengantar Sistem Manufaktur; Prinsip-Prinsip Manufaktur; Sumber Daya, Proses Produksi Dan Organisasi Produksi; Lay-Out Produksi, Perancangan, Penjadwalan dan Pengendalian Proses Produksi; Productive Maintenance, Logistik Dan Inventori; Quality Enginerig (Quality Control, Quality Function Deployment (QFD), Total Quality Management); Sistem Manajemen Mutu (8 Prinsip Manajemen Mutu, Standard Internasional Sistem Manajemen Mutu: ISO 9001, ISO 9004, ISO TS 16949; Standard Internasional Sistem Manajemen: ISO 14001, OHSAS 18001); System And Process Improvement: Cause-Effect Analysis, FMEA (Failure Mode And Effect Analysis), Lean Six Sigma.

Buku Ajar:

1. Hitomi, Katsundo. Manufacturing System Engineering. Taylor & Francis. 2001
2. TQM : A Cross Functional Prespective, Rao, CARR, Dambolena, Kopp, Martin, Rafii, Schlesinger, John Willey, 1996
3. TQM, Text, Cases and Readings, Joel E. Ross, St. Lucie Press 100 E. Linton Blvd Suite 403 B Delray Beach, FL 33483

ENME803174 - MANAJEMEN RISIKO (4 SKS)**Tujuan Pembelajaran:**

Arus informasi yang cepat dan adanya kekhawatiran peraturan dan pengawasan, manajemen membutuhkan pemahaman dan pengukuran risiko. Manajemen risiko menetapkan standar untuk menggabungkan informasi yang berbeda, mengumpulkan data, menghitung ukuran risiko dan menciptakan alat pelaporan yang tepat waktu untuk manajemen. Mata kuliah ini mengarahkan mahasiswa untuk memahami bagaimana risiko kompleks dengan skala besar dapat diukur dan dikelola.

Silabus:

Introduction to risk management, Value at Risk --VaR Risk measures for various asset classes, Monte Carlo Simulation, VaR Validation and Extremes, Regulatory Environment 25 years of risk related regulations, Multifactor models Discussion of multifactor analysis, Review of industry leading risk management system, Operational Risk and its Basel II requirements.

Buku Ajar:

1. Jorion, Philippe, Value at Risk: The New Benchmark for Managing Financial Risk, 3rd edition, McGraw-Hill, 2007
2. Roger Lowenstein, When Genius Failed, Random House, 2000

ENME804155 - CAD/CAM (4 SKS)**Tujuan Pembelajaran:**

Kuliah CAD/CAM membahas teknologi CAD, CAM, Integrasi CAD/CAM dan aplikasinya pada industri yang menekankan pada: prinsip pemodelan geometri kurva dan permukaan (geometric modelling), perancangan model 2D dan 3D dengan bantuan komputer. Prinsip pertukaran data antar sistem CAD/CAM serta perancangan tool path berbantuan komputer untuk model prismatic dan sculptured. Kuliah CAD/CAM diberikan dengan tujuan agar mahasiswa memiliki pemahaman dan menerapkan teknologi CAD/CAM: mulai dari melakukan proses desain hingga proses produksi dengan bantuan komputer.

Silabus:

Tinjauan Umum Sistem CAD/CAM; Piranti Keras & Lunak Sistem CAD/CAM; Interactive Tools dan Konsep Komputer Grafik; Geometric Modelling: Tipe & Representasi Matematis Model Kurva, Surface & Solid; Pertukaran Data dalam dan antar sistem CAD/CAM; Proses-proses Manufaktur: Review Jenis Proses Manufaktur dan Perhitungan Parameter Pemesinan, Praktikum CAD; Teknologi CNC; Metode Tool Path Generation dalam sistem CAM; Pengendalian 'kualitas hasil permesinan' dalam system CAM; Computer Aided Process Planning -CAPP; Postprocessing; Praktikum CAM

Buku Ajar:

1. Kiswanto G., Handout CAD/CAM, Diklat kuliah, 2004.
2. Choi B. K., Jerard R. B., Sculptured Surface Machining,
3. Zeid, I., CAD/CAM Theory and Practice, McGraw-Hill, 2009.
4. Chang, T. -C., Computer Aided Manufacturing, 3rd ed, Prentice-Hall, 2005.
5. Korem, Y., Computer Control of Manufacturing Systems, McGraw-Hill

ENME804156 - PENILAIAN KINERJA MANUFAKTUR (4 SKS)**Tujuan Pembelajaran:**

Memberikan pemahaman terhadap teori probabilitas dan model antrian diberikan sebagai landasan membuat model dari sistem manufaktur yang bersifat probabilistik/ stokastik dan teknik penyelesaiannya. Pembahasan lanjut guna memberi kemampuan menganalisis pengaruh rencana proses terhadap desain sistem manufaktur dalam kaitannya pada aliran material, proses manufaktur, perakitan, penyimpanan, aliran informasi, kapasitas dan waktu .

Silabus:

Manufacturing Process & System Overview; Probability (basic concept, Markov chain Process); Teori Antrean (Queueing): Waiting line management; Single Part Type, Multiple stage System; Single Stage, Multiple Part Type System; Manufacturing System Design; Manufacturing Process & Planning: Variant & Generative; Group Technology; Cellular Manufacturing; Flexible Manufacturing System; Case study (assignment & evaluation)

Buku Ajar:

1. Guy L. Curry, Richard M. Feldman, Springer, "Manufacturing System Modelling and Analysis"
2. Tien-Chien Chang, Richard A. Wysk, Hsu-Pin Wang, Prentice Hall International Series. "Computer Aided Manufacturing"
3. William W. Luggen, Prentice Hall International Editions, "Flexible Manufacturing Cells and Systems"
4. Arthur L. Foston, Carolena L. Smith, Tony Au, Prentice Hall International Editions "Fundamentals of Computer Integrated Manufacturing"

ENME801163 - REKAYASA KENDARAAN DAN ALAT BERAT (4 SKS)**Tujuan Pembelajaran:**

Mata ajaran ini memberikan pemahaman teknologi terkini dari kendaraan penumpang beroda empat khususnya dengan meliputi semua aspek dalam rekayasa kendaraan. Kuliah rekayasa kendaraan diberikan dengan tujuan agar mahasiswa mempunyai kompetensi dasar untuk melakukan rekayasa pada kendaraan penumpang beroda empat khususnya.

Silabus:

Gaya & Dinamika Kendaraan; Sistem Rem, Roda dan Suspensi; Sistem Keamanan: Aktif dan Pasif pada saat Mengalami Masalah.

Buku Ajar:

1. Bosch Automotive Handbook, Sixth Editions, 2006
2. Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, 2004
3. Heisler, Heinz. Advanced Vehicle Technology, 2004
4. Hermann, Hans. SAE Handbook of Automotive Engineering, 2004
5. Miliken, William F., Douglas L. Milliken, Maurice Olley, Chassis Design : Principles and Analysis, 2004
6. Pacejka, Hans B. Tire & Vehicle Dynamics, SAE, 2006

ENME801164 - SISTEM PENGGERAK MULA DAN PENYALUR DAYA (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa mempunyai kompetensi dan keahlian dalam prinsip kerja dan teori sistem penggerak mula meliputi motor pembakaran dalam, motor listrik, motor hibrida yang dihubungkan dengan sistem penyalur daya serta mampu melakukan perhitungan konstruksi dan rancangan.

Silabus:

Teknologi Motor Bakar: mesin *reciprocating/rotary piston*; Teknologi Motor Listrik (AC/DC Motor); Teknologi Motor Hibrida: *Serial/parallel hybrid*; Teknologi Sistem Penyalur Daya (Transmisi): MT, AT, DCT, CVT; Teknologi Baterai.

Buku Ajar:

1. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 1989
2. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.
3. Bosch Automotive Handbook, Sixth Editions, 2006
4. Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, 2004

5. Heiszler, Heinz. *Advanced Vehicle Technology*, 2004
6. Hermann, Hans. *SAE Handbook of Automotive Engineering*, 2004

ENME802165 - REKAYASA RANGKA DAN BADAN KENDARAAN (4 SKS)

Tujuan Pembelajaran:

Memberikan pemahaman berbagai konsep terkait perancangan dan analisis rangka kendaraan seperti:

- Pemahaman singkat mengenai sejarah perkembangan perancangan kendaraan
- Pemahaman perancangan kendaraan dan interaktivitas di dalam proses perancangan dan manufaktur kendaraan, meliputi berbagai jenis struktur kendaraan dan kegunaannya
- Pemahaman bagaimana beban dapat dianalisis secara sederhana dan dengan menggunakan komputer meliputi analisis sederhana struktur yang fokus kepada proses - proses yang terlibat pada struktur kendaraan
- Pemahaman konsep dasar terkait aerodinamika badan kendaraan dan kalkulasi dasar yang diperlukan untuk merancang aerodinamika badan kendaraan

Silabus:

Introduksi inovasi dan terobosan penemuan terkini didalam bidang otomotif dan perkembangan industry otomotif. Pemahaman konsep pembebanan pada struktur kendaraan, berbagai jenis kerangka kendaraan, analisis struktur dengan metode sederhana permukaan struktur (Simple Structural Surface method) dan metode perhitungan struktur skeletal (method of computing the skeletal structure). Gaya aerodinamika, pengurangan gaya angkat (pengurangan gaya drag). Stabilitas dan konsep perhitungan dinamika badan kendaraan.

Buku Ajar:

1. Heinz Heiszler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 0 7680 10713.
2. Brian Cantor, Patrick Grant and Colin Johnston, "Automotive Engineering Lightweight, Functional, and Novel Materials", Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN 978-0-7503-1001-7.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978-1-4020-8676-2.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.
5. Nick Tucker and Kevin Lindsey, "An Introduction to Automotive Composite", Rapra Technology Limited, ISBN: 1-85957-279-0.
6. Jason C. Brown, A. John Robertson, and Stan T. Serpento, "Motor Vehicle Structures: Concepts and Fundamentals", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 0750651342
7. Liang Yun · Alan Bliault · Johnny Doo, WIG Craft and Ekranoplan, "Ground Effect Craft Technology", ISBN 978-1-4419-0041-8 e-ISBN 978-1-4419-0042-5, DOI 10.1007/978-1-4419-0042-5, Springer New York Dordrecht Heidelberg London.
8. Matthew Huang, "Vehicle Crash Mechanics", CRC Press LLC, International Standard Book Number 0-8493-0104-1.
9. Ahmed A. Shabana, Khaled E. Zaaza and Hiroyuki Sugiyama, "Railroad Vehicle Dynamics a Computational Approach", CRC Press is an imprint of the Taylor & Francis Group, ISBN 978-1-4200-4581-9.

ENME803166 - SISTEM PENGENDALIAN KENDARAAN (4 SKS)

Tujuan Pembelajaran:

Mahasiswa memahami fitur - fitur dasar sistem pengendalian kendaraan dan memiliki kemampuan untuk:

- Mendeskripsikan metode sederhana untuk analisis sistem suspensi kendaraan dan komponen - komponennya;
- Mendeskripsikan persyaratan perancangan sistem suspensi kendaraan dan bagaimana cara memperolehnya;
- Menganalisis berbagai faktor dan isu - isu yang mempengaruhi perancangan suspensi;
- Memahami mekanika roda kendaraan
- Mendeskripsikan perkembangan terkini mengenai kontrol sistem pengereman dan perancangannya serta materialnya
- Analisis pengaruh karakteristik sistem kemudi terhadap pergerakan kendaraan

Silabus:

Introduksi peran sistem suspensi kendaraan, faktor - faktor yang mempengaruhi perancangan, definisi dan terminologi sistem suspensi kendaraan, mekanisme mobilitas suspensi, berbagai jenis suspensi, analisis kinematika, analisis pusat rotasi (*roll center analysis*), komponen suspensi. Basis sistem pengereman. Regulasi, fungsi, dan terminologi dalam sistem pengereman, komponen sistem pengereman, dan konfigurasi serta kinematika sistem pengereman. Pertimbangan gaya adhesi proposional dengan sistem pengereman dan efisiensi pengereman. Deformasi, gaya lateral, dan sudut slip ban pada saat kendaraan berjalan. Karakteristik penikungan (*cornering characteristics*) menurut pendekatan teoritis Fiala terhadap model matematika dan dampak tekanan udara ban.

Buku Ajar:

1. Heinz Heiszler, "Advance Vehicle Technology", Society of Automotive Engineers Inc. ISBN 0 7680 1071 3
2. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978- 1-4020-8676-2.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: System Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8673-1 e-ISBN: 978-1- 4020-8675-5.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.

ENME803167 - TEKNOLOGI MUTAKHIR KENDARAAN (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa memahami konsep teknologi manufaktur dan sistem control kendaraan untuk:

- Analisis kondisi kemajuan teknologi terkini sehingga dapat membuat perubahan fundamental dalam perancangan kendaraan yang berkelanjutan
- Merancang proses untuk membuat sistem kontrol otomatis yang membantu pengendalian kendaraan
- Merancang kendaraan dengan system control elektronik yang dapat meningkatkan performa kendaraan
- Mendeskripsikan integrasi dalam system control kendaraan dan interaksi system mekanikal dan elektrikal yang dapat menunjang perancangan dan pengembangan kendaraan masa depan

Silabus:

Kontrol *Knock*, Kontrol kecepatan *idle* solenoid linear, Injeksi bahan bakar *sequential*, *Distributorless ignition*, *Self-diagnosis for fail-safe operation*, Pengukuran posisi sudut *Crankshaft* untuk waktu pengapian, *Direct mass air flow sensor*, Variable valve phasing, teknologi kendaraan *Hybrid Electric*, dan Kendaraan Elektrik.

Buku Ajar:

1. Julian Happian-Smith, "An Introduction to Modern Vehicle Design", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 07506 5044 3.
2. Heinz Heisler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 07680 1071 3.
3. Fuhs, Allen E., "Hybrid vehicles and the future of personal transportation", CRC Press, Taylor & Francis Group, ISBN-13: 978-1-4200-7534-2, ISBN-10: 1-4200-7534-9.
4. Lino Guzzella and Christopher H. Onder, "Introduction to Modeling and Control of Internal Combustion Engine Systems", Springer-Verlag Berlin Heidelberg, ISBN 978-3-642-10774-0 e-ISBN 978-3-642-10775-7, DOI 10.1007/978-3-642-10775-7, Library of Congress Control Number: 2009940323.
5. Iqbal Husain, "ELECTRIC and HYBRID VEHICLES Design Fundamentals", CRC PRESS Boca Raton London New York Washington, D.C., ISBN 0-203-00939-8 Master e-book ISBN, International Standard Book Number 0-8493-1466-6 (Print Edition), Library of Congress Card Number 2002041120.
6. Ali Emadi, "Handbook of Automotive Power Electronics and Motor Drives", Taylor & Francis Group, CRC Press is an imprint of Taylor & Francis Group, ISBN 0-8247-2361-9.
7. Nicolas Navet and Françoise Simonot-Lion, "Automotive Embedded Systems Handbook", CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN-13: 978-0-8493-8026-6, ISBN-10: 0-8493-8026-X
8. Paul Nieuwenhuis and Peter Wells, "The automotive industry and the environment A technical, business and social future", Woodhead Publishing ISBN 1 85573 713 2, CRC Press ISBN 0-8493-2072-0, CRC Press order number: WP2072.
9. Simon Tung, Bernard Kinker, and Mathias Woydt, "Automotive Lubricant Testing and Advanced Additive Development", ASTM 100 Barr Harbor Drive PO Box C700, West Conshohocken, PA 19428-2959, ISBN: 978-0-8031-4505-4.
10. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Oxford Brookes University, Oxford, UK, Acenti Designs Ltd., UK. ISBN 0-470-85163-5.

ENME803195 - PERALATAN PENGEBORAN MINYAK DAN GAS (4 SKS)**Learning Objective(s):**

Memberikan pemahaman mengenai implementasi pengetahuan dasar kompetensi teknik yang merupakan inti teknologi peralatan pengeboran minyak dan gas. Kompetensi yang diharapkan dari mahasiswa yang telah mengikuti perkuliahan ini adalah lulusan yang memiliki nilai tambah terkait pengetahuan teknik peralatan pengeboran minyak dan gas serta siap dan mampu beradaptasi dengan mudah dalam dunia industri minyak dan gas pada umumnya dan pengeboran minyak dan gas pada khususnya. Tujuan dan luaran pembelajaran yang diharapkan adalah sebagai berikut:

1 Mahasiswa mengetahui peralatan dasar serta fungsinya dan bagaimana setiap peralatan tersebut diperlukan dalam operasi pengeboran minyak dan gas.

2 Mahasiswa mampu menjelaskan teknik operasi pengeboran minyak dan gas serta berbagai aspek terkait seperti peralatan yang digunakan, isu keselamatan, perlengkapan keselamatan, isu lingkungan, dan kondisi darurat

3 Mahasiswa memiliki pemahaman yang baik mengenai peralatan pengeboran dan operasinya sehingga dapat berpartisipasi dalam operasi pengeboran minyak dan gas di dunia kerja dan siap untuk meningkatkan pengetahuan dan skill selama bekerja

Syllabus:

Pendahuluan sumur minyak/gas, Eksplorasi minyak/gas, produksi dan eksploitasi, drilling rig, termonologi dan permasalahan pengeboran of drilling, fluida pengeboran, system pengeboran minyak dan gas, perlengkapan sistem *hoisting*, perlengkapan sistem *rotating*,

perlengkapan sistem *circulatin*, perlengkapan system daya, sistem pencegahan *blowout*, perancangan sumur, perlengkapan dan operasi untuk keselamatan dan efisiensi, proses dan perlengkapan untuk *cementing*, persiapan pengeboran, operasi pengeboran, permasalahan pada proses pengeboran (*drill string vibration* dan *whirling*, *collar failure*, dan lain - lain) metode *artificial lift* dan perlengkapannya, kunjungan industri pengeboran minyak dan gas.

Text Book(s):

1. Don A. Gorman, Jerry W. Meyer, "Drilling Equipment and Operations", Action Systems Inc., Dallas, Texas - USA.
2. Adam T. Bourgoyne, Martin E. Chenevert, et. al., "Applied Drilling Engineering", Society of Petroleum Engineers, Richardson, Texas - USA.
3. Nguyen J.P., "Drilling-Oil and Gas Field Development Techniques", Institut Français du Pétrole Publication, 1996
4. Kermit E. Brown, "The Technology of Artificial Lift Methods", Volume 2a, Petroleum publishing Co., 1980
5. Amanat U.C., "Oil Well Testing handbook", Elsevier, 2004
6. Amanat U.C., "Gas Well Testing handbook", Elsevier, 2004

ENME804168 - TEKNIK KENDARAAN REL (4 SKS)**Tujuan Pembelajaran:**

Memberikan mahasiswa pengetahuan dan kemampuan untuk analisis dan perancangan kendaraan rel.

Silabus:

Teknik dan analisis ekonomi kendaraan rel; struktur dan rangkai kendaraan rel; analisis structural *flat car*; *coupler analysis*; electrical dan pressurized air; analisis dan pemodelan bogie; axle; wheel; brake dan pivot; sistem suspensi dan kualitas mengendarai; analisis beban dinamik; fatigue dan retakan pada kendaraan rel; model kendaraan rel dan geometri lintasan; pemodelan komponen *rolling stock*; respon kendaraan rel pada lintasan tangen; stabilitas lateral kendaraan rel pada lintasan tangen; respon kendaraan rel pada lintasan melengkung; keausan roda; dinamika kendaraan rel.

Buku Ajar:

1. Simon Iwnicki, handbook of railway vehicle dynamics, CRC Press, Taylor & Francis Group, 2006.

ENME804197 - MESIN DAN PERALATAN PENGANGKAT (4 SKS)**Learning Objective(s):**

Memberikan kompetensi dan keahlian peminatan kepada mahasiswa dalam bidang perancangan serta pengembangan peralatan pengangkat dan alat-alat konstruksi

Syllabus:

Pengenalan dan Cakupan Alat Konstruksi; Traktor, Bulldozer, Shovel dan Dump Truck; Konsep Mekanikal Alat Konstruksi; Sistem Pelengkap Alat Berat: Pneumatic dan Hydraulic; Dasar Mesin-mesin Pengangkat dan Pengangkut Bahan; Cranes, Hoist dan Conveyor; Mesin Pengangkat Barang: Moving Walks, Escalators, Elevators.

Pre-requisite(s): Perancangan Mekanikal, Tugas Merancang.

Text Book(s):

1. ASME. Handbook of Materials Handling.
2. Mc.Guiness. Mechanical and Electrical Equipment for Building.

ENME804198 - SISTEM KENDALI DAN STABILITAS PESAWAT TERBANG (4 SKS)**Learning Objective(s):**

Provide the students with the knowledge and ability in analyzing the aircraft (A/C) stability and control.

Syllabus:

Systems of Aircraft Axes and Notation, Aircraft Static Equilibrium and Trim, The Equations of Aircraft Motion, Aircraft Longitudinal Dynamics, Aircraft Lateral-Directional Dynamics, Aircraft Maneuverability, Aircraft Stability, Aircraft Flying and Handling Qualities, Aircraft Stability Augmentation, Aircraft Aerodynamic Modelling, Aircraft Aerodynamic Stability and Control Derivatives

Pre-requisite(s) -

Text Book(s) :

1. Cook, Michael V., Flight Dynamics Principles, Elsevier Aerospace Engineering Series, 2007.
2. Russell, J.B., Performance and Stability of Aircraft, Butterworth Heinemann, 2003.
3. Von Mises, Richard, Theory of Flight, Dover Books on Aeronautical Engineering, 1959

ENME801179 - TERMOFLUIDA LANJUT (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa diharapkan memahami konsep-konsep massa, momentum, kalor, kerja, energy dan entropi pada mekanika termofluida. Memahami prinsip dasar hidrostatis, pengukuran aliran, mengidentifikasi sistem termofluida atau volume atur dan aliran dari masa, momentum, kalor dan kerja yang berhubungan dengan permasalahan yang diberikan. Memahami konsep gaya angkat dan gaya gesek. Menggunakan hukum ke-1 dan ke-2 termodinamika pada system termofluida.

Silabus:

Pengantar termofluida, Hidrostatik, Pendekatan Volume Atur, Persamaan Bernoulli, Kurva Streamline, Konsep Dasar Termodinamika, Hubungan properties dan gas-gas ideal, penggunaan hukum ke-1 termodinamika pada perfect gas, hukum ke-2 termodinamika, temperatur, entropy, penggunaan entropy, Motor Bakar, analisa volume atur, proses aliran tunak, turbin gas dan mesin-mesin jet.

Buku Ajar:

1. Cengel, Y.A. & Boles, M.A. Thermodynamics: An Engineering Approach
2. Homsy, G.M. (Ed.) Mechanics of Fluids
3. Moran, M.J. & Shapiro, H.N. Fundamentals of Engineering Thermodynamics
4. Nakayama, Y.; & Boucher, R.F. Introduction to Fluid Mechanics
5. Rogers, G.F.C. & Mayhew, Y.R. Engineering Thermodynamics
6. Samimy, M., Et Al. A Gallery of Fluid Motion
7. Sonntag, R.E., Borgnakke, C., & Van Wylen, G.J. Fundamentals of Thermodynamics
8. Van Dyke, M. An Album of Fluid Motion

ENME801180 - SUMBER DAYA MARITIM (4 SKS)**Tujuan Pembelajaran:**

Mahasiswa diharapkan memahami sumber daya laut dan peluang, serta risiko yang terkait dengan potensi yang mereka eksploitasi. Mahasiswa akan mempelajari pengetahuan tentang pembentukan, eksplorasi dan produksi sumber daya laut: tidak hanya minyak dan gas tetapi juga mineral-mineral lain, serta sumber daya flora dan fauna laut, termasuk dampaknya terhadap kelestarian lingkungan.

Silabus:

Minyak dan gas dari laut, tambang dasar laut, energy dari pencairan es, energy laut, flora dan fauna laut, kelestarian lingkungan laut.

Buku Ajar:

1. Research Council National Research Council, NEW Mining in the Outer Continental Shelf and in the Deep Ocean, University Press of the Pacific, 2005
2. Arthur H. Johnson, Michael D. Max, William P. Dillon, Natural Gas Hydrate - Arctic Ocean Deepwater Resource Potential, Springer, 2013
3. Khaligh, Alireza and Onar, Omer C., Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems, CRC Press, 2009

ENME802181 - TEKNOLOGI DAN MANAJEMEN MARITIM (4 SKS)**Tujuan Pembelajaran:**

Tujuan pembelajaran mata kuliah ini adalah agar mahasiswa memahami berbagai pengetahuan tentang teknologi angkutan laut dan juga pemanfaatan sumber energi yang berbasis kelautan. Mata ajaran ini juga bertujuan agar mahasiswa memahami peluang-peluang kemaritiman yang dapat dikembangkan dengan memanfaatkan teknologi.

Silabus:

Klasifikasi kapal sesuai fungsinya, aspek-aspek yang harus dipertimbangkan dalam mendesain kapal, sejarah perkembangan bangunan lepas pantai, Lingkungan laut, Jenis-jenis bangunan lepas pantai: fixed desain dan floating desain, sistem mooring dan anchor, Perhitungan gaya dan perhitungan kekuatan bangunan lepas pantai, FPSO.

Buku Ajar:

1. International Energy Authority Renewable Energy Technology Deployment (IEA-RETD),
2. Offshore Renewable Energy: Accelerating the Deployment of Offshore Wind, Tidal, and Wave Technologies., IEA-RETD 2012.
3. Chakrabarti, Handbook of Offshore Engineering, Elsevier. 2007

ENME803182 - ENERGI LAUT (4 SKS)**Tujuan Pembelajaran:**

Kuliah ini menelaah tentang teknologi dan prinsip-prinsip yang berkaitan dengan perancangan sistem energi laut terbarukan.

Silabus:

Pengantar energi terbarukan, pengenalan untuk turbin angin, sistem pasang surut dan sistem energi gelombang, OTEC, arus laut, metode penilaian ekonomi yang berlaku untuk energi terbarukan lepas pantai, sumber daya energi angin, teori momentum dan batas angin output daya, pasang surut aliran dan konversi ke tenaga mesin, deskripsi sumber daya energi gelombang, perangkat energi gelombang dan perangkat simulasi energi gelombang.

Buku Ajar:

1. Twidell, J. and Weir, T., "Renewable Energy Resources. Second Edition", Taylor and Francis Group, 2006.
2. Boyle, G., "Renewable energy power for a sustainable future, Second Edition", Oxford University Press, 2005.
3. Walker J and Jenkins N, "Wind Energy Technology", Wiley Unesco Energy Engineering Series, 1997.
4. Manwell JF, McGowan, JG and Rogers, AL., "Wind Energy explained: Theory, Design and Application", Wiley. 2nd Edition. ISBN0-470-01500-4, 2010
5. Cruz, J., "Ocean Wave Energy: Current Status and Future Perspectives", Springer-Berlin, 2007.
6. Falnes, J., "Ocean Waves and Oscillating Systems: Linear Interactions Including Wave-Energy Extraction", Cambridge University Press, Cambridge, 2002.
7. Baker AC, "Tidal Power", Peter Peregrinus Ltd, 1981.

ENME803183 - BANGUNAN LEPAS PANTAI (4 SKS)**Tujuan Pembelajaran :**

Memberikan pengetahuan, pemahaman mengenai teori, dan prinsip bangunan lepas pantai mencakup jenis, fungsi, dan teknologi bangunan lepas pantai serta teknik dalam melakukan perancangan strukturnya.

Silabus :

Jenis-jenis Bangunan Lepas Pantai; Konstruksi dan Struktur Bangunan Lepas Pantai; Perhitungan Gaya dan Kekuatan Bangunan Lepas Pantai; Persyaratan Keselamatan; Konstruksi Semi-submersible; Single Mooring Buoy; FPSO; Perawatan dan Perbaikan Bangunan Lepas Pantai.

Prasyarat : Teori Bangunan Kapal, Kekuatan Kapal (pernah mengambil)

Buku Ajar :

1. Cliff Gerwick, Construction of Marine and Off-shore Structures, CRC Press 1999
2. Subrata Chakrabarti, Handbook of Offshore Engineering, Elsevier Science, 2005
3. Yong Bai, Marine Structural Design, Elsevier Science, 2003

ENME803184 - MANAJEMEN TRANSPORTASI LAUT DAN KEPELABUHANAN (4 SKS)**Tujuan Pembelajaran :**

Memberikan pengetahuan, dan pemahaman mengenai berbagai pendekatan pengelolaan transportasi laut dan kegiatan kepelabuhanan yang juga mencakup faktor resiko, keselamatan, dan ekonomi.

Silabus :

Trend Permintaan Transportasi Laut; Riset Pasar Transportasi Laut; Sistem Angkutan Inter Moda; Sistem Bongkar Muat Pelabuhan, Penentuan Jenis Angkutan Laut, Sistem Pergudangan Dan Penyimpanan Cargo, Sistem Keagenan, Survey Muatan, Perhitungan Keekonomian Perusahaan Pelayaran, Kepabeanaan.

Prasyarat : -**Buku Ajar :**

1. P. Lorange, Shipping Management, Institution for shipping Research.
2. Patrick Alderton, Reeds Sea Transport : Operation and Management, Adlard Coles, 2008
3. Patrick Alderton, Port Management and Operations, Informa Business Publishing, 2005
4. Svein Kristiansen, Maritime Transportation : Safety management and Risk analysis, Butterworth-Heinemann, 2004
5. M. Stopford, Maritime Economics, Routledge, 1997
6. House, D.J, Cargo Work for Maritime Operation, Butterworth Heinemann, 2005

ENME803185 - HUKUM DAN PERATURAN KEMARITIMAN (4 SKS)**Tujuan Pembelajaran :**

Memberikan pengetahuan, dan pemahaman mengenai hukum dan peraturan yang berlaku pada kegiatan kemaritiman baik nasional maupun internasional.

Silabus :

Pengenalan Produk Hukum Kemaritiman; Peraturan Pencegahan dan Penanggulangan Pencemaran Laut; SOLAS; Peraturan Pencegahan Tabrakan; ISM Code; Statutory Rules; Peraturan Kapal Penumpang; Peraturan Tanker; Peraturan Bangunan Lepas Pantai; Peraturan Penyelamatan Kecelakaan; Peraturan IMO lainnya. Program pencegahan kecelakaan; Penilaian dan analisis risiko (Risk assessment and analysis).

Prasyarat : -**Buku Ajar :**

1. International Convention for the Prevention of Pollution From Ships (MARPOL), International Maritime Organisation Publications
2. International Regulations for Preventing Collisions at Sea (COLREG), International Maritime Organisation Publications
3. International Convention for the *Safety of Life at Sea* (SOLAS), International Maritime Organisation Publications
4. International Safety Management Code (ISM Code) Guide Book, International Maritime Organisation Publications
5. Churchil R.R. dan Lowe A.V, The Law of the Sea, MUP 1999

ENME804186 - KAPAL KHUSUS (4 SKS)**Tujuan Pembelajaran :**

Memberikan pengetahuan, pemahaman dan kompetensi kepada mahasiswa dalam melakukan perancangan kapal untuk berbagai keperluan khusus.

Silabus :

Tipologi dan Fungsi Kapal Khusus; Material untuk Kapal Khusus; Pertimbangan Perancangan; Perhitungan Pembebanan; Perhitungan Besaran Kapal; Perhitungan Struktur; Sistem Propulsi; Sistem Olah Gerak; Tata Ruang Kapal Khusus; Sistem Keselamatan dan Navigasi; Perhitungan Stabilitas.

Prasyarat : -**Buku Ajar :**

1. Lars Larsson dan Rolf Eliasson, Principles of Yacht Design, International Marine/Ragged Mountain Press, 2007
2. Dave Gerr, The Elements of Boats Strength, International Marine/Ragged Mountain Press, 1999
3. Norman L. Skene, dan Marnard Bray, Elements of Yacht Design, Sheridan house, 2001
4. Steve Killing dan Doug Hunter, Yacht Design Explained : A Sailors Guide to the Principles and Practices of Design, W.W Norton and Company, 1998
5. S. Sleight, Modern Boat Building, Conway Maritime Press.

ENME804187 - MANAJEMEN PRODUKSI KAPAL (4 SKS)**Tujuan Pembelajaran :**

Memberikan pengetahuan dan pemahaman mengenai berbagai teknik dan pengelolaan galangan kapal.

Silabus :

Tata Letak Galangan Kapal; Tahapan Proses Produksi Kapal; Perencanaan Steel Stock Yard; Perhitungan Utilisasi Crane; Perhitungan Jamorang Pada Tiap Tahapan Produksi; Pembuatan Jadwal Kerja; Work Break Down Structure; Integrated Hull Outfitting and Painting; Advanced Outfitting; Metoda Group Technology untuk Produksi Kapal; Berbagai Cara Peluncuran Kapal; Uji Coba Kapal.

Prasyarat : Pengantar Teknik Perkapalan (pernah mengambil)

Buku Ajar :

1. D.J. Eyres, Ship Construction, Butterworth- Heinemann, 2007
2. R.Shenoi, Ship Production Technology, Univ. Of Southampton.
3. National Research Council, Shipbuilding Technology and Education, National Academy Press, 1996

ENME804188 - MANAJEMEN ENERGI MARITIM (4 SKS)**Tujuan Pembelajaran :**

Kuliah ini memberikan pemahaman tentang analisis maksimalisasi energy yang dihasilkan dari bahan bakar minimum, juga analisis maksimalisasi kerja yang dihasilkan dari energy awal minimum

Silabus :

Prinsip dan regulasi energy maritime, Perancangan dan operasi kapal yang efisien, Manajemen energy pada bangunan lepas pantai, Manajemen energy pada pelabuhan, Energi terbarukan, Aspek SDM pada manajemen energy

Prasyarat : -**Buku Ajar :**

1. Hongyi Lai, "Asian Energy Security: The Maritime Dimension", Palgrave MacMillan, 2009
2. Steve Doty, Wayne C. Turner, "Energy Management Handbook 8th Ed.", Fairmont Press, 2012
3. Petrecca, Giovann, "Energy Conversion and Management: Principles and Applications," Springer, 2014

ENME804189 - KESELAMATAN KEMARITIMAN (4 SKS)**Tujuan Perkuliahan :**

Menyediakan pengetahuan dan pemahaman terkait perlindungan keselamatan dan barang melalui peraturan, manajemen dan pengembangan segala bentuk teknologi transportasi kemaritiman.

Silabus :

SOLAS: Provisi Umum, konstruksi, alat keselamatan, radio komunikasi, navigasi keselamatan, pengangkutan barang, manajemen untuk keselamatan operasi kapal, MARPOL Annex I-V peraturan untuk pencegahan polusi, keamanan maritim; ancaman perdagangan maritim, ancaman terhadap pengapalan, evolusi keamanan maritim, implementasi ISPS Code, perencanaan keamanan.

Persyaratan: Pengantar Teknik Perkapalan**Referensi:**

1. Jones. S. Maritime Security: A practical Guide, the nautical institute 2012
2. Consolidate Edition, MARPOL, International Maritime Organization, 2006
3. Consolidate Edition, SOLAS, International Maritime Organization, 2004

ENME804190 - TEKNIK LAS LANJUT (4 SKS)**Tujuan Perkuliahan:**

Menyediakan pengetahuan terkait teknik las lanjut meliputi desain sambungan las, pengembangan detail prosedur penyabungan, pemilihan material terkait proses penyambungan dan kontrol kualitas produk akhir. Teknik las lanjut, memberikan gambaran komprehensif terkait area penelitian rekayasa pengelasan yang meliputi proses pengelasan baru dan prosedur pengelasan untuk material baru. Sehingga, pengembangna pada prosedur fabrikasi dan efisiensi desain pengelasan berkembang secara berkelanjutan

Silabus:

Kinetika dan transformasi fasa, korosi dan keausan , proses pengelasan lanjut, metalurgi las lanjut, analisa desain dan simulasi pada struktur las, pengujian tidak merusak dan evaluasinya, fabrikasi dan kualitas struktur las-an.

Rereferensi :

1. AWS, Welding Handbook, American Welding Society, 2000
2. Singh, R. Applied Welding Engineer-Process Code and Standard, Elsevier, 2012
3. J.R. Davis. Corrosion of Weldments, ASM International, 2006
4. Xin S. Failure Mechanism of advances welding process, Woodhead publishing, 2010

MAGISTER TEKNIK MESIN FAST TRACK

Untuk mahasiswa yang berkeinginan dan berkemampuan untuk melanjutkan program pendidikan ke jenjang Magister Teknik melalui program Fast track, maka dapat dilakukan transfer kredit sebanyak maksimal 22 sks. Jumlah sks yang dapat ditransfer tersebut adalah 14 sks dari M.A wajib peminatan dan 8 sks dari 2 buah M.A pilihan peminatan @ 4 sks.

M.A wajib peminatan dan M.A. pilihan peminatan yang diakui, sehingga dapat ditransfer kreditnya adalah jika M.A tersebut sesuai dengan M.A. yang ada pada pilihan Peminatan Program studi Magister Teknik (S2) Teknik Mesin.

Persyaratan untuk mahasiswa dalam mengikuti program Fast Track adalah sbb:

1. Menyatakan keinginannya untuk mengikuti Program Fast Track, dengan menulis Surat Permohonan kepada Ketua Departemen Teknik Mesin dengan menyertakan Rencana Studi berupa rencana pengambilan mata ajaran pada Semester 6 s.d. 8 (pada Program Sarjana Teknik) dan mata ajaran Semester 1 s.d. 4 (pada Program Magister Teknik) sesuai dengan Peminatan Program Magister Teknik, paling lambat pada akhir Semester 5 program Sarjana Teknik Mesin atau Teknik Perkapalan.
2. Memiliki nilai akademik yang sangat baik, dengan Indeks Prestasi Akademik Kumulatif (IPK) sampai dengan Semester 5, minimum 3.2, dan sudah lulus seluruh Mata Ajaran Dasar.
3. Memiliki penanggung jawab dan atau beasiswa untuk menyelesaikan pendidikan Sarjana Teknik dan Magister Teknik dengan Skema *Fast Track*.
4. Mahasiswa yang mengikuti Program Fast Track menyampaikan kesediaanya untuk mengikuti Program Akademik

secara Penuh Waktu.

5. Apabila Permohonan mengikuti Skema Fast Track dapat disetujui oleh Ketua Departemen/Program Studi, maka mahasiswa yang bersangkutan akan berdiskusi bersama dengan Penasehat Akademik untuk finalisasi Rencana Studi Sarjana Teknik (S1) dan Magister Teknik (S2)nya.

Mahasiswa Program Studi Sarjana Teknik (S1) yang telah disetujui rencana melanjutkan studinya ke jenjang Magister Teknik (S2) oleh Ketua Departemen Teknik Mesin, perlu segera menyesuaikan rencana studinya pada Semester 7 dan 8, khususnya dalam pengambilan Mata Ajaran Pilihan S1-nya dengan menyesuaikan diri dengan Mata Ajaran Wajib dan Pilihan pada jenjang program studi Magister Teknik sesuai Peminatannya.

COURSE DESCRIPTION

ENME800001

ADVANCED ENGINEERING MATHEMATICS (4 SKS)

Learning Objective(s):

Complete student's analytical ability. Students understand and able to use the advanced mathematical concepts in order to solve the engineering problems

Syllabus :

Introduction to differential equation, 1st order differential equation, 2nd order differential equation, higher order differential equation, vector analysis, vector differential, grad operation, divergence and curl, vector integration, laplace transform, laplace transform to solve the differential equation, fourier transform, convolution, numerical method, root of equation, numerical differentiation, numerical integral

Pre-requisite(s): -

Text Book(s):

1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENME800003

DESIGN OF EXPERIMENT (2 SKS)

Learning Objective(s):

This course provides knowledge on methods of planning, execution and reporting of the research in the field of engineering so that students are able to apply scientific principles in the preparation of the thesis in particular, as well as in a scientific publication from the research. Students should be able to manage an investigation that began from the planning stages, applying the correct procedure and constructs apparatus design, and apply instrumentation and measurement systems, to execute and perform the analysis and interpretation of data by the rules of statistics properly.

Syllabus:

Introduction: Introduction to Research Design, Problem Solving Approaches, Research Project Planning, Design and Application Measurement Systems: Elements of Functional Measurement

Systems, Performance Measurement System Characteristics, Analysis of Accuracy (Uncertainty) Systems, Design and Construction of Apparatus Research, Planning Experiments, execution experiments: Construction of the apparatus, the apparatus Debugging, Datasheet and logbooks; Analysis and Interpretation of data; Communication Engineering: Principles of Communication Engineering, Report, Paper, and Research Articles.

Pre-requisite(s) : -

Text Book(s):

1. Montgomery, D.C., Design and Analysis of Experiments, (5th ed.), John Wiley and Sons, Inc., New York, 2001
2. Coleman, H.W., Steele, G.W.Jr., Experimentation and Uncertainty Analysis for Engineers, (2nd ed.), John Wiley and Sons, Inc., New York, 1999
3. Doebelin, E.O., Engineering Experimentation: Planning, Execution, Reporting, McGraw-Hill, Inc., New York, 1995
4. Kirkup, Les., Experimental Method: An Introduction to the Analysis and Presentation of Data, John Wiley and Sons Australia, Ltd., Queensland, 1994
5. Lipson, C, Sheth, N.J., Statistical Design and Analysis of Engineering Experiments, Mc-Graw Hill Kogakusha, Ltd., Tokyo, 1973

ENME802003

ACADEMIC WRITING (2 SKS)

Learning Objective(s):

Student able to understand the basic academic writing to improve the capability of reading the scientific paper, reference and to write argumentation accurately with the proper and proficient language effectively. This course also study the critical thinking, propose the argumentation, formulate basic reasoning and how to deliver the idea with correct language. Student will study how to write the scientific paper with good technique, able to find and to make proper list of reference.

Syllabus:

Introductoin to academic writing, rhetoric analysis in scientific paper, act critically and argumentation in academic writing, academic writing techniques, draft scientific paper, peer review and scientific paper revision, find scientific resources, synthesis scientific paper, present the paper as a result from this course

Pre-requisite(s) : -

Text Book(s):

1. Ross, V. *A Brief Guide to Critical Writing*. Philadelphia, PA : Critical Writing Program. 2015.
2. Graff, G., Birkenstein, C. *As He Himself Puts It : The Art of Quoting "They Say / I Say" : The Moves That Matter in Academic Writing*. New York. 2006
3. Rheingold, H. *Net Smart : How To Thrive Online*. Cambridge, Mass : MIT Press. 2012.

ENME800002

ENGINEERING COMPUTATION (2 SKS)

Learning Objective(s):

The purpose of this course is that students know well and are able to apply the processes and methods (algorithms) calculations (numerical and analytic) of engineering in the real world of computing and computer-based parameters that affect the speed and accuracy of the calculation.

Syllabus :

The purpose of this course is that students know well and are able to apply the processes and methods (algorithms) calculations (numerical and analytic) of engineering in the real world of computing and computer-based parameters that affect the speed and accuracy of the calculation.

Pre-requisite(s): -

Text Book(s):

1. Chapra, Steven C. and Canale, Raymond P. *Numerical Methods for Engineers* 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. *Advanced Engineering Mathematics* 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, *An Introduction to the Analysis of Algorithms*, Addison Wesley.
4. Cheney W., Kincaid D., *Numerical Mathematics and Computing*, Cole Publishing

ENME800005

SCIENTIFIC PUBLICATION (2 SKS)

Learning Objective(s):

Student can develop logical, critical, systematical and creative thinking using scientific research and/or creation of design in science and technology by consider and apply social values. And by using scientific concept and discussion, scientific way and ethics, the paper will be written and published in accredited scientific journal and accepted in international journal under supervision one or more supervisor.

Syllabus:

Pre-requisite(s): Academic Writing, Design of Experiment

Text Book(s):

1. Jurnal ilmiah terkait bidang penelitian

ENME800006

SEMINAR (2 SKS)

Learning Objective(s):

Student will study to apply the science and previous knowledge to conduct independent research under one or more supervisor(s). After this course, student able to design and to analyze under supervised research, and able to write the research finding scientifically and systematically in research paper format. Student also should come to defend the design of experiment in front of board of examiner in seminar examination forum.

Syllabus: -

Pre-requisite(s): Passed 24 credit units

Text Book(s):

1. Panduan Teknik Penulisan Tugas Akhir Universitas Indonesia

ENME800007

THESIS (6 SKS)

Learning Objective(s):

Student will study to apply the science and previous knowledge to conduct independent research under one or more supervisor(s). After completing this course, student should able to make research concept by applying related theories. Under supervision of supervisor, student can design, integrate, implement and analyze concept and writing the research finding systematically and scientifically in thesis book. Student also should come to defend the design of experiment in front of board of examiner in thesis examination forum

Syllabus:

Pre-requisite(s) : Passed 24 credit units

Text Book(s):

1. Panduan Teknik Penulisan Tugas Akhir Universitas Indonesia

ENME801101- ADVANCED THERMODYNAMICS (4 SKS)**Learning Objective(s):**

Provide further understanding of the science of thermodynamics and its applications so that students are able to design and conduct a basic research mapun able to complete the analysis involves the calculation of the thermodynamic system correctly and systematically in order to find the best solution gentang effectiveness of the use of substances and energy, especially in the 'engineering design' by motto: 'Low entropy production', 'high thermal efficiency' and 'low pollution effect'.

Syllabus :

Basic Thermodynamics and Gas Dynamics, Equilibrium of Thermodynamics System, Thermodynamics properties of System, Thermodynamics of ideal gas mixture, review of chemical thermodynamics, review of chemical kinetics, conservation equation for multicomponent reaction system, pre-mixed laminar flames, method of measuring flame velocity (bunsen burner), flame quenching, flammability limit of premixed laminar flame, gaseous diffusion flame and combustion of single liquid droplet, combustion in compression ignition engine, combustion in spark ignition engine, combustion research in hydrocarbon oxygen mixture, engine research, combustion-generated emission, experimental method : preasure measurement and recording; temperature measurement and recording; combustion photography and flame speed detection; spectrographic method; chemical analysis technique (NDIR, FID, Gaschromatography).

Text Book(s):

1. Holmann, J.P., Thermodynamics, Intl. Student Edition, McGraw Hill, 2005.
2. Kenneth Wark Jr. Thermodynamics, McGraw Hill, 2003.
3. Francis F. Huang, Engineering Thermodynamics, MaxWell Macmillan Intl. Edition, 2000.
4. H.D. Baehr, Termodinamik, Springer Verlag
5. K. Stephan, Termodinamik, Grundlagen und technische Anwendung-en, Band 1, Band Springer Verlag.
6. Bejan, Adrian, Advanced Engineering Thermodynamics, Wiley - interscience, 2nd Edition, 1997

ENME801102 - ADVANCED FLUID DYNAMICS AND HEAT TRANSFER (4 SKS)**Learning Objective(s):**

Enhance the ability of students in the study of fluid mechanics in more detail so as to conduct research or the application of science in industrial applications. Studying the mechanism of heat transfer in a control volume due to the existence of the temperature difference and concentration as well as the involvement of one, two or three phases at the time simultaneously.

Syllabus :

Viscous flow of Newtonian fluid, membrane boundary flow, Non-Newtonian Fluid Flow, Two- Multi Phase Flow, Particle Displacement Flow, Porous Media and Fluidized Beds, Turbulent Flow and Mixing, Jet, Chimney, Energy and Momentum Equatio, one-two-three dimension conduction heat transfer, heat transfer on extended surface.

Text Book(s):

1. Frank P Incroperre, David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
2. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
3. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 3rd Ed. John Wiley & Sons, 1996, New York
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 6th Ed. Brooks/cole, 2001, USA
7. Abbott I R, Theory of Wing Section, Dover Publications.
8. Bird R B, Transport Phenomena, John Wiley & Sons.

ENME802103 - ENERGY SYSTEM OPTIMIZATION (4 SKS)**Learning Objective(s):**

This course provides an understanding of mathematical modeling, simulation and optimization of energy systems through technical and economical approach. The course is intended to equip student with the ability to understand mathematical model, simulation and optimization of thermal systems.

Syllabus:

Workable System Design; Economical Evaluation; Determination of Mathematical Equations; Thermal Equipment Modeling; System Simulation; System Optimization: Objective Function, Constraints; Lagrange Multipliers: Lagrange multiplier to complete the optimization process; Dynamics, Geometric and Linear Programming; Mathematical Model of Thermodynamics Properties; Big System Simulation under Steady Condition; Big Thermal System Simulation; Calculation of Variables in Optimum Conditions.

Pre-requisite(s): Matematika Teknik, Termodinamika Dasar, Mekanika Fluida.

Text Book(s):

1. Stoecker, W.F. Design of Thermal System, 3rd Edition, Mc.Graw Hill Book Co, 2011.
2. Boehm, R.F., Design of Analysis of Thermal System, John Wiley&Sons, 1987.
3. Yogesh Jaluria, Design and Optimization of Thermal Systems, 2nd Edition, Mc.Graw Hill Book Co, 2007.

ENME803104 - THERMAL POWER GENERATION (4 SKS)**Learning Objective(s):**

The course objective is to provide an understanding of the basic principles of power generation, and basic competency in the design and development of power generation systems.

Syllabus:

Industrial Power Plant and Steam System: Boiler, Steam Turbine, Gas Turbine; Cogeneration Engineering, Instrumentation and Main Tools; Performance and Reliability Factors; Economical Aspects, Environmental Aspects: Settings and Prevention.

Pre-requisite(s): -

Text Book(s):

1. Tyler G. Hicks, Power Plant Evaluation and Design Reference Guide, McGraw Hill, 1986.
2. Sill and Zoner, Steam Turbine Generator Process Control and Diagnostics, Wiley Higher Ed., 1996.
3. Saranavamuttoo et.al, Gas Turbine Theory, 6th Edition, Prentice Hall, 2008.
4. Black and Veath-Power plant engineering , Philips Keameh-Power generation handbook
5. Steam Generators by Babcock Willcock
6. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.

ENME803105 - INTERNAL COMBUSTION ENGINE (4 SKS)

Learning Objective(s):

Student is expected to have competency and expertise in the field of his interest of internal combustion engine working principle and theory and is able to design and do construction calculation.

Syllabus:

Actual Cycle of Internal Combustion Engine; Fuel System; Ignition and Combustion in Spark Ignition Engine and Compressed Ignition Engine; Some Basic Characteristics and Calculations; Basic Engine Design; Determination of Engine's Main Components; Kinematics and Dynamics Analysis of the Motion; Calculation and Planning of Lubrication and Cooling System.

Pre-requisite(s): -

Text Book(s):

1. Guzela L, Onder, C., Introduction to Modelling and Control of Internal Combustion Engines, 2nd Edition, Springer, 2014
2. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 2011
3. Taylor, C.F., Internal Combustion Engines, in Theory and Practice, M.I.T Press, England, 1985.
4. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.

ENME803106 - APPLIED FLOW MEASUREMENT AND VISUALIZATION (4 SKS)

Learning Objective(s):

Applied flow diagnostic study measurement and visualization techniques which have wide application both in industry and laboratory. The course give basic competency for the student to be bale to understand various measurement and visualization methods and to design appropriate flow diagnostic system in process installation in industry or experimental set up in a scientific research activities which related to fluid flow.

Syllabus :

Statistics Diagnostic Flow, Calibration in Flow Measurement; Momentum Sensing Meter (orifice plate, venturi, nozzle meters); Positive Displacement Flow Meter (Nutating Disc, Sliding Vane, Gear meters, etc.); Electromagnetic and Ultrasonic Flow Meters; Compressible Flow Meter (Wet Gas and Wind Anemometer); Principles Local Velocity Measurement in Liquid and Gases; Hot Wire Anemometry; Based Laser Velocimetry (LDV, PIV); Principles of Flow Visualization, Flow Visualization conventional; Shadowgraphs and Schliern Technique; Interferometry Technique; Light Sheet Based Technique ; Image Processing and Computer Assitested Method.

Pre-requisite(s): Fluid Mechanics, Fluid System

Text Book(s):

1. Yang ,W.J, Handbook of Flow Visualization, Taylor and Francis. 2001
2. Baker, R.C., Flow Measurement Handbook: Industrial Designs, Operating Principles, Performance and Applications, Cambridge University Press, 2005

ENME803107 - CFD APPLICATIONS (4 SKS)

Learning Objective(s):

Understanding the basic principles of CFD and having the basic knowledge in applying CFD (Computational Fluid Dynamic)

Syllabus:

Prediction-rule Principles, Numerical Solutions: Advantages and Disadvantages; Mathematical Description of Physical Phenomena; Basic Nature of Coordinates; Discretization Method; Volume-set Application on Heat Conduction Problem; Convection and Diffusion; Two-Dimension Discretization Equations; Three-Dimension Discretization Method; Special Procedure Needs; Some of Constraints Associated with the Representation of Pressure-gradient Factors, Continuity Equations Representation; Stayered Grid; SIMPLE Algorithm; Revision of SIMPLER algorithm; Final Solutions: Basic Properties of Iterative Numerical Procedures; Sourceterm Linearization, Irregular Geometries, Preparation and Testing a Computer Programs.

Pre-requisite(s): None

Text Book(s):

1. Suhas V. Patankar, 1980, Numerical Heat Transfer and Fluid Flow, McGraw Hill.
2. C.A.J. Fletcher, 1996, Computational Techniques for Fluid Dynamics, 2nd edition, Springer Verlag
3. A.D. Gosman et al., 1985, COMPUTER AIDED ENGINEERING Heat Transfer dan Fluid Flow, John Wiley & Sons.

ENME803108 - REFRIGERATION ENGINEERING (4 SKS)

Learning Objective(s):



Refrigeration engineering course provides basic competency for the student to be able to do the simulation software to design a cooling system and equipments involved with a very close relationship with the Industrial and engineering users. Hence student will have understanding in design and development of cooling system and ability to evaluate and analyze its performance, especially on cold storage.

Syllabus:

Principles of Refrigeration and Heat Pump, Terminology and Units; Mechanical Vapor Compression Refrigeration Engine; Heat Transfer in Refrigeration System; p-h Diagram Calculation in Refrigeration Cycle; Refrigerant, Lubricant, Salt and the Environment; Compressors; Condenser and Evaporator; Refrigeration Piping System and Equipments; Automatic Control System and Safety Equipments; Air Properties; Psychrometric and its process; Absorption Refrigeration; Alternative refrigeration Cycles (adsorption, gas compression, and ejector); Display Case, Prefabricated Cold Storage and Cold Storage, Cold Room Calculations.

Pre-requisite(s): Basic Thermodynamics

Text Book(s):

1. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 1995.
2. Kuehn, Ramsey and Therkeld, Thermal Environmental Engineering, 3rd Edition, Prentice Hall, 1998.
3. Threkeld, J.L., Thermal Environmental Engineering, Prentice Hall.
4. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 2001
5. ASHRAE Handbook of Refrigeration, ASHRAE, Atlanta, 2002.

ENME803124 - ENERGY AUDIT (4 SKS)

Learning Objective(s):

This course focuses on the theory, techniques and practices of analyzing energy aspects of building operations and correlating a building envelope's interaction with the mechanical systems. Students will perform a detailed energy audit of a state-of-the-art commercial building design using energy modeling simulation software and develop energy conservation strategies, such as thermal storage, that can be applied to heating, cooling, and ventilating equipment to reduce utility bills. Students will apply supporting analytical data to develop operations and maintenance changes designed to improve energy efficiency and reduce operating cost.

Syllabus:

Energy Auditing Basics, Energy Accounting and Analysis, Understanding the Utility Bill, Energy Economics, Survey Instrumentation, The Building Envelope Audit, The Electrical System Audit, The Heating, Ventilating and Air-Conditioning Audit, Upgrading HVAC Systems for Energy Efficiency Verification of System Performance, Maintenance and Energy Audits, Self-Evaluation Checklists, World-class Energy Assessments, and Water Conservation.

Pre-requisite(s): -

Text Book(s):

1. Albert Thumann, William J. Younger, Terry Niehus, Handbook of Energy Audits, Eighth Edition, The Fairmont Press, 2010.
2. Moncef Krarti, Energy Audit of Building Systems: An Engineering Approach, Second Edition, CRC Press, Taylor & Francis Group, 2010.

ENME803125 - ENERGY AND ENVIRONMENT (4 SKS)

Learning Objective(s):

This course will provide an understanding of the impact of environmental damage caused by the processing and use of energy and the implementation of preventive and remedial measures that are used in modern industrial processes.

Syllabus :

Ecological principles & energy flow, environmental concerns of energy extraction, energy use & climate change, environmental and ethical concerns, International treaties & convention on environmental mitigation. Environmental technology and pollution prevention, planning and management of industrial processes in order to prevent potential damage to the environment, Process Safety, energy recovery from waste, sustainable development, combustion and gas explosions, alternative energy.

Pre-requisite(s): -

Text Book(s):

1. F.M. Vanek, L.D. Albright and L.T. Angenent. Energy Systems Engineering: Evaluation and Implementation, 2nd Edition. Mc. Graw Hill Companies, 2012.
2. Ristinen R.A. Kaushaar J.J. Energy and the environment, 2nd edition, John Wiley & Sons, 2006
3. Banerjee B.P. Handbook of energy and environment in India, Oxford University Press, 2005, India
4. M.C. Dass, Fundamentals of Ecology, Tata McGraw Hill, 1994
5. Kaushik N.D. Kaushik K. Energy, Ecology & Environment, Capital Publishing, 2004
6. De A.K. Environmental Chemistry, New Age International Publishers, 2005

ENME803196 - JET PROPULSION AND ROCKET (4 SKS)

Learning Objective(s):

Syllabus :

Text Book(s):

ENME804109 - HEAT AND MASS TRANSFER ENGINEERING (4 SKS)**Learning Objective(s):**

The course objective is to provide understanding of the heat exchangers used in many industrial processes and power plants as the application of heat transfer. This course provides a basic competency to know main heat exchanger types and to understand and able to select suitable heat exchanger type for current applications. Student is also expected to understand basic factors in designing heat exchangers, to estimate size and price and know and choose the type of heat exchanger. Provide basic understanding and various parameters on the drying process so that students can perform calculations and analysis of various drying techniques and their applications. This course also provides the expertise so that students are able to do drying modeling, to design and analyze the system for various materials (solid and solvent) so that the drying process can be suitably selected for particular product.

Syllabus:

Heat Transfer Review; Type and Application of Heat Exchangers; Practical Design of Shell and Tube Heat Exchanger (Thermal and Mechanical); Manufacturing Cost Estimation; Heat Exchangers; Operation and Monitoring of Heat Exchangers (Fouling And Vibration); Maintenance of Heat Exchangers; Corrosion on Heat Exchangers; Heat Exchanger Design Software; Presentation and Laboratory Practice of Heat Exchangers. Review Transfer Phenomena (Momentum, Heat and Mass); Drying Principles and Basics; Mathematical Modeling of Drying System; Classification and Selection of Dryer, Post-Harvest Drying and Storage of Grain; Rotary Drying; Vacuum Drying; Fluidized Bed and Spouted Bed Drying; Drum Dryer; Spray Drying, Freeze Drying; Conveyor Drying; Solar Drying; Energy Optimization in Drying System; Drying System Design.

Pre-requisite(s): Heat and Mass Transfer, Fluid Mechanics

Text Book(s):

1. Frank P Incropera, David P De Witt, Fundamental heat and mass transfer, 7th Ed., John Wiley & Sons, 2011, New York
2. Holman JP, Heat Transfer, 10th, Mc Graw Hill, 2009.
3. Smith Eric, Thermal Design of Heat Exchanger, John Wiley & Sons, 1996, New York
4. Welty R James, Wicks Charles, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 6th Ed. John Wiley & Sons, 2014, New York.
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 7th Ed. Brooks/cole, 2010, USA
7. Rohsenow Warren, Hartnett James, Cho Young, Handbooks of Heat Transfer, 3rd Ed., Mc Graw Hill, 1998, New York.

ENME804110 - COMBUSTION ENGINEERING (4 SKS)**Learning Objective(s):**

Combustion Engineering provide basic competency to investigate, analyze and learn about the process of combustion of fuel, and the nature and behavior of flame. The course provides basic understanding to apply the laws of basic aerothermochemistry in the engineering calculation of practical combustion engineering. The student is expected to be able to analyze the combustion behavior of a flame and to develop knowledge in the field of combustion engineering.

Syllabus:

Syllabus: Important Meaning of Combustion Study; Basic Reaction and Stoichiometry of Combustion; Gas Fuel (BBG); Liquid Fuel, Solid Fuel; Basic Thermochemistry and Fluid Dynamics of Combustion; Principles of Conservation of Mass and Continuity; Turbulence Premixed Flame Structure; Detonation; Combustion Technology; Fixed-Bed Combustion, Suspension, Fluidized- Bed; Study on Flame and Combustion Technology; Minimum Temperature Self-ignition (Auto/ Self-Ignition); Flammability Limit; Fire spread, Fire Suppression Material, Combustion and the environment. **Pre-requisite(s):** Basic Chemistry, Basic Thermodynamics, Basic Fluid Mechanic, Heat and Mass Transfer.

Text Book(s):

1. Turn, S.R., An Introduction to Combustion, 3rd Edition, McGraw-Hill, Inc. 2011
2. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.
3. Griffiths, J.F., and Barnard, J.A., Flame and Combustion, 3rd Edition, Blackie Academic and Professional, 1995.
4. Glassman, I., Combustion, 5th Edition, Academic Press, 2014.
5. Warnatz, J., Maas, U., and Dibble R.W., Combustion, 2nd Edition, Springer-Verlag, 1998.

ENME804111 - AERODYNAMICS ENGINEERING (4 SKS)**Learning Objective(s):**

Aerodynamic Engineering is an advanced course of Fluid Mechanics which focusing on aeronautics applications. Through the course students is expected to be able to understand the fundamental principles and basic equations of aerodynamics and to apply them in the process of airfoil design and to understand performance characteristics of the airfoil. Student is able to understand the phenomenon of incompressible flow through the airfoil and finite wings. Student is expected to be able to have an understanding of subsonic and supersonic compressible flow phenomena through aerofoil and other compressible flow phenomena.

Syllabus:

Introduction on Aerodynamics; Basic and Principle Equations; Incompressible flow; Airfoil Aerodynamics Characteristics; Finite Wings; Incompressible Flow through Airfoil; Incompressible Flow through Finite Wings; Airfoil in Compressible Flow; Wings and Wings-Body Combination in Compressible Flow; Airfoil Design; Double Surface; Vortex Lift; Secondary Flow and Viscous Effect; Other Phenomena in Compressible Flow; Normal Shock Wave; Oblique Shock Wave; Expansion Wave; Supersonic Wave.

Pre-requisite(s): Fluid Mechanics, Basic Thermodynamics

Text Book(s):

1. A.M. Kuethe and C.Y. Chow, Foundations of Aerodynamics, 5th Edition, John Wiley & Sons, Inc., 2009.
 2. B.W. McCormick, Aerodynamics, Aeronautics, and Flight Mechanics, 6th Edition, John Wiley & Sons, Inc., 2010.
- J Anderson, Fundamentals of Aerodynamics, 5th Edition, McGraw Hill, 2011.

ENME804112 - TURBOMACHINERY (4 SKS)

Learning Objective(s)

Students understand the different types of construction of gas and steam turbines, and their characteristics and performance, including support equipment.

Syllabus :

Characteristics and types of steam and gas turbines to the generated power output, the calculation of its performance, power improvement, condenser performance, combined cycle plant, system vibrations in turbine construction.

Text Book(s):

1. Thermische Stromung Machine by Traupel

ENME801113 - VENTILATION AND AIR CONDITIONING SYSTEM (4 SKS)

Learning Objective(s) :

This course provide the understanding and basic competence in design the air conditioning system regarding a better air condition. The student will provided with knowledge about the environmentally friendly refrigerant.

Syllabus :

Basic of Air Conditioning: Air Cooled dan Water Cooled Chiller, Packaged Unit, Direct Expansion and Split Unit; Basic VAC Calculation : Design Condition, Load Estimating, Cooling Load; Sistem Ventilasi : Air Changes, Outdoor Air Requirement, Indoor Air Quality. Clean Space and Air Filter System in industry and hospital; distribution system: Equal Friction Method and Static Regain, Duct and Piping Sizing; Air Conditioning System Components : Chiller, Cooling Tower, Fan, S and AHU; Control System in Building.

Pre-requisite(s): Refrigeration System

Text Book(s) :

1. Ronald Howell, Harry J.Sauer, Jr and William J.Coad : Principles of HVAC, ASHRAE 1998.
2. Carrier : Handbook of HVAC
3. ASHRAE Standard
4. Overseas Vocational Training Association Employment Promotion Corporation : Fundamentals of refrigeration and Air Conditioning.

ENME801129 - THERMOFLUID AND RADIATION (2 SKS)

Learning Objective(s):

Students are able to understand and implement the knowledge of fluid mechanics and heat transfer convection and radiation to describe and analyze the phenomenon of fire and its effects on the environment.

Syllabus :

This course will discuss the knowledge of thermofluid, the phenomenon of heat transfer by convection and radiation, phenomena of thermofluid and radiation in various forms of combustion such as smoldering, pool fire, gasification, as well as the formation and the occurrence of radiation that turned to achieve ignition.

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. Munson, B.R., Fundamentals of Fluid Mechanics 4th Ed, John Wiley & Sons, Inc. 2000
3. Frank P Incropera, 1. David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
4. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
5. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.

ENME801130 - INTRODUCTION TO FIRE DYNAMICS (2 SKS)

Learning Objective(s):

Students understand the basic and important parameters in the process of the fire, the phenomenon of fire dynamics and fire hazards.

Syllabus :

The fundamental laws of aerothermochemistry such as combustion thermodynamics, fluid mechanics, heat transfer, combustion chemical reactions in fire dynamics calculations. Students can perform experimental activities in the lab to understand the dynamics of fire behavior, with the equipment available, such as the phenomenon of flame premixed and non-premixed, ignition, combustion of solid and liquid, forming plumes and smoke production.

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Kuo., K., Principles of Combustion, John Wiley & Sons Ltd, 1986.
5. Turn, S.R., An Introduction to Combustion 2nd Edition, McGraw-Hill, Inc. 2000.

ENME802131- FIRE PROTECTION SYSTEM (2 SKS)**Learning Objective(s):**

Students are able to understand the fire protection system both passive and active.

Syllabus :

Compartmentalization of fires, Strategy of passive fire protection, natural ventilation systems for controlling smoke and heat from fire, fire resistant material and installation, integration of automatic fire protection systems for passive fire protection strategies, the design of passive fire protection systems, fire modeling for the design of passive protection system. Physical and chemical phenomena that are relevant to a wide range of hardware and software of a fire protection system such as automatic sprinkler, gaseous agent, foam and powder chemical systems. Installation of fire protection systems according to prevailing standards. Refractory materials and installation.

Text Book(s):

1. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
2. Fire Protection Association, Passive Fire Protection Handbook, 2011
3. Tewarson A, Khan MM (1991) The Role of Active and Passive Fire Protection Techniques in Fire Control, Suppression and Extinguishment. Fire Safety Science 3:1007-1017. doi:10.3801/IAFSS.FSS.3-1007
4. Jurnal dan standar terkait

ENME804118 - BUILDING MECHANICAL AND ELECTRICAL SYSTEM (4 SKS)**Learning Objective(s):**

The course's objective is to deliver knowledge, skills and understanding of the mechanical and electrical systems in a modern building that has been increasing in its requirements in terms of sophistication, efficiency, and low energy use.

Syllabus:

General Building Mechanical System, Plumbing System: SNI, Calculation, Waste Water Management, Building Energy System; Building Automation System; Lift and Escalator: Types, Round Trip Time, Handling Capacity, Waiting Time, Installation and Control System; Escalator Types, Application and Installation, Building Automation System,

Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME801121 - ENERGY MANAGEMENT SYSTEM (4 SKS)**Learning Objective(s):**

Students are able to understand the concept, analysis and strategy of continuous improvement of energy performance by implementing effective energy management practices and energy processes in accordance with the standards and rules of both local and international as well as the use of associated technical equipment.

Syllabus :

Introduction, Energy Policy, Energy Plan, Implementation and operation of energy management systems, Energy Management Organizational Preparation, planning, implementation and evaluation of Energy Management, Energy Management Review, software on an energy management system, case studies

Text Book(s):

1. Energy management handbook / by Wayne C. Turner & Steve Doty ©2007 by The Fairmont Press, Inc
2. Guide to energy management by Barney L. Capehart, Wayne C. Turner, William J. Kennedy--Fifth Edition--International Version ©2008 by The Fairmont Press.
3. Effective implementation of an ISO 50001 energy management system (EnMS) / Marvin T. Howell. American Society for Quality, Quality Press, Milwaukee 53203 © 2014

ENME803133 - ASSIGNMENT OF BUILDING UTILITY SYSTEM DESIGN (4 SKS)**Learning Objective(s):**

Students are able to use and apply the concept of utility system design of the building that includes a ventilation system and HVAC, plumbing, fire protection, and sewage treatment.

Syllabus :

The course consists of the task of designing a system utility story buildings.

Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME803134 - ENCLOSURE FIRE DYNAMICS AND MODELLING (4 SKS)**Learning Objective(s):**

Students understand the various stages of fires and provide basic knowledge methods and techniques applied in the analysis

of fire development, and develop students' ability to critically analyze the methods of practical application. This course also aims to improve the ability to understand and analyze the fires model.

Syllabus:

Introduction to the process of combustion, premixed flame and diffusion flame, ignition and spread of fire, classification of fires and the influence of the geometry of the room. Calorimetry fire: heat release rate, mass loss rate and the relationship between time and heat release rate, the growth of fire in the room, as well as testing methods. The dynamics of the flame: fire plume and flame (flame), a high flame, the flame height correlation.

Text Book(s):

1. Dougal Dysdale, An Introduction to Fire Dynamics, 3rd Edition, John Wiley and Sons, 2011.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Thierry POINSOT, Denis VEYNANTE, Theoretical and Numerical Combustion.
5. Jurnal dan standar terkait.

ENME803115 - CLEAN ROOM (4 SKS)

Learning Objective(s):

Provide an understanding of the basic knowledge of clean room systems and its application in buildings, hospital and pharmaceutical industries. Understanding of the concept of air cleanliness, ventilation and fresh air exchange, application of laminar flow, the air pressure in the chamber and measuring systems, validation and its control.

Syllabus:

Indoor environment: human psychological and physiological aspects, BEAM IAQ assessment; Air quality: air cleanliness, ambient air quality, rationale for standards; Indoor air pollutants: gaseous pollutants, airborne particulate, VOCs, radon, biological contaminants; Indoor air movement: air flow in confined and unconfined spaces, filtration systems; Instrumentation and measurement techniques; Control measures: improved IAQ by HVAC system design, removal of contaminants.

Pre-requisite(s): -

Text Book(s):

1. ASHRAE : HVAC Design Manual for Hospitals and Clinics Second Edition, 2013
2. W. Whyte, Clean Room Technology Fundamentals of Design, Testing and Operation, John Wiley & Sons Ltd., 2001
3. John D. Spengler, J.M.Samet, J.F McCarthy, Indoor Air Quality Handbook, McGrawHill, 2001.

ENME803116 - PLUMBING AND WASTE WATER TREATMENT SYSTEM (4 SKS)

Learning Objective(s):

This course will study the specialization expertise and understanding of the system plumbing systems found on modern buildings which are increasing demands in terms of sophistication, efficiency, and use of more energy-efficient.

Syllabus :

Plumbing system in general, the calculation of water needs and hot water, water tanks, plumbing equipment unit, pumps, water hammer application, wastewater treatment systems. Will be given an understanding of the plumbing system of clean water for many multi-storey buildings and sewerage system and the filth and the effects of the foam pressure.

Pre-requisite(s): -

Text Book(s):

1. Soufyan M. Noerbambang, Takeo Morimura, "Perancangan dan Pemeliharaan Sistem Plambing", Pradnya Paramita, 2009.
2. Louis S.Nielsen, "Standard Plumbing Engineering Design", McGraw-Hill, 1982,
3. IPC, "International Plumbing Code", International Code Council, 2009.
4. ASPE, "Plumbing Engineering Design Handbook- Volume 1 & 2", ASPE, 2004.
5. B.B. Sharp & D.B Sharp, "Water Hammer - Practical Solutions", Butterworth Heinemann, 2003.
6. Metcalf & Eddy, "Wastewater Engineering - Treatment and Reuse", McGraw-Hill Co.,2003.
7. Shun Dar Lin, "Water and Wastewater Calculation Manual", McGraw-Hill, 2007.
8. Michael Frankel, CPD, "Facility Piping Systems Handbook - For Industrial, Commercial, and Healthcare Facilities", McGraw-Hill, 2010.
9. 2012 Uniform Plumbing Code, IAPMO 2012

ENME803117 - BUILDING ENVIRONMENT ASSESSMENT (4 SKS)

Learning Objective(s):

Students are provided with an understanding to increase the awareness of environmental issues and the impact of buildings on the environment and be able to evaluate the ability of new and existing buildings to meet a wide range of environmental performance criteria.

Syllabus :

Global issues: electrical loading and equivalent CO₂ production, ozone depletion and global warming, abusive use of natural resources; Local issues: demand of electricity, use of water, wastewater discharge, recycled material, local environmental impact; Building environmental assessment methods; Assessment of energy use; Energy audit; Indoor issues: indoor environmental quality factors, current legislation and standards; Pollutants in buildings; Indoor air quality; Health and safety; Safety audit; Health audit.

Pre-requisite(s): -

Text Book(s):

1. Energy-Efficient Building Systems Green Strategies for Operation and Maintenance, Dr. Lal Jayamaha, McGraw-Hill, 2006.
2. Bradon, S.P., and Lombardi, P., (2005) Evaluating Sustainable Development in the Built Environment, Blackwell Science Ltd., Oxford.
3. An Environmental Assessment for Existing Building Developments. Version 5/03, May 2003
4. An Environmental Assessment for New Building Developments. Version 4/03, May 2003
5. Energy audit of building systems : An engineering approach, Moncef Krarti, 2nd edition, CRC Press Taylor & Francis Group, 2011

ENME803135 - FIRE FIGHTING ENGINEERING AND STRATEGY (4 SKS)**Learning Objective(s):**

This course will provide scientific and practical knowledge on all aspects of the techniques and strategies to effectively extinguish the fire source.

Syllabus :

Forcible Entry, Fire Extinguishing Technique (covers the types of extinguishing material), Fire Fighting of High Rise Building, Safe Work at Heights, Compartment Fires and Tactical Ventilation and Fire Communication and Mobilization Officer.

Text Book(s):

1. Delmar Cengage Learning, Firefighter's Handbook: Essentials of Firefighting and Emergency Response 2nd edition, ISBN-13: 978-1401835750, Delmar Thomson Learning, 2004
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME803136 - FIRE SAFETY MANAGEMENT IN BUILDING (4 SKS)**Learning Objective(s):**

This course will provide scientific knowledge concerning all aspects of Safety Management in Buildings.

Syllabus :

Fire Safety Management, Fire Hazard Identification, Making Plans Activity, Organizational Structure and Development of Human Resources, and Fire Control and Prevention in the building.

Text Book(s):

1. Daniel E. Della-Giustina, Fire Safety Management Handbook, CRC Press, 2014
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME804118 - MECHANICAL SYSTEM FOR BUILDING (4 SKS)**Learning Objective(s):**

These courses provide students a basic understanding and competency building mechanical system design that includes a ventilation system and HVAC, plumbing, fire protection, and sewage treatment.

Syllabus :

The course consists of the task of designing a buildings utility system.

Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME804119 - ACOUSTIC (4 SKS)**Learning Objective(s):**

Provide a basic understanding of the concept of acoustic, acoustic systems in buildings as well as the concept of controlling the propagation of sound in the ventilation system and ventilation.

Syllabus :

Acoustic fundamentals: fundamental properties of sound and waves, sound propagation and transmission inside buildings and in air ducts; Acoustic design and planning: requirements for auditoria, lecture theatres, plant rooms and etc., directional and spacial impression, reverberation, echo, silencers, active noise control; Environment impact and local legislation; Vibration: acoustically driven vibration, control and transmission; Problem investigations: noise and vibration measurement, data analysis techniques, software packages.

Text Book(s):

1. Acoustic Noise Measurement. J. R. Hassall (1979).
2. An Environmental Assessment for Existing Office Buildings. BRE (1993).
3. CIBSE Guide B12 Sound Control (1976).
4. Concert Halls and Theatres: How they sound. L. L. Beranek (1996).
5. Engineering Principles of Acoustics. D. D. Reynolds (1981).
6. Fundamentals of Acoustics. L. E. Kinsler, A. R. Frey, A. B. Coppens and J. V. Sanders (1982).
7. Handbook of Acoustics, M.J. Crocker, Wiley (1998).

8. ASHRAE HVAC System and Equipment, ASHRAE Atlanta, 2012
9. Noise Control in Building Services. A. Fry (1988).

ENME804120 - MAINTENANCE MANAGEMENT OF BUILDING UTILITY (4 SKS)

Learning Objective(s):

After following this course, students will understand the strategic role of maintenance of buildings based on the need for maintenance management of assets built that includes a needs assessment, planning and prioritizing, budgeting and adequate information systems.

Syllabus :

Introduction, Scoping of Maintenance Function and Demand in Buildings, Essentials of Built Assets Maintenance Management, Assignment: Contemporary Issues in Asset Maintenance Management, Seminars/workshops

Text Book(s):

1. Armstrong, J. & Saville, A. (2005). Managing your building services, The Chartered Institution of Building Services Engineers, London.
2. Harris, J. & Hastings, P. (2004). Business-focussed maintenance, BSRIA Publications.
3. Canter, B. & Swallow P. (1996). Building Maintenance Management, Blackwell Science. (ISBN: 0-632-03419-X)
4. Wood, B. (2003). Building Care. Blackwell Publishing. UK. (ISBN 0-632-06049-2)
5. Wordsworth, P. (2001). Lee's Building Maintenance Management, 4th Ed., Blackwell Science, UK. (ISBN 0-632-05362-3)
6. Building Services Handbook, Sixth edition, Fred Hall and Roger Greeno, Butterworth-Heinemann, 2011
7. ASHRAE Guideline 0-2005, The Commissioning Process

ENME804137 - FIRE INVESTIGATION ENGINEERING (4 SKS)

Learning Objective(s):

This course will provide an understanding and scientific knowledge of fire investigation within the scope of the legislature regarding fire safety regulations.

Syllabus :

Compartment Fires, Flame Spread, Forensic Science, Laboratory Analytical Techniques, Modelling for helping the investigation, and case studies on fire.

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME804138 - EVALUATION AND MAINTENANCE OF FIRE PROTECTION SYSTEM (4 SKS)

Learning Objective(s):

Students can evaluate the performance of the fire protection system and to know and be able to plan maintenance of fire protection systems.

Syllabus :

This course will provide engineering evaluation of the performance of fire protection systems are used in various types of buildings and engineering preparation of a management plan for decision-making. Fire protection systems will be elaborated into elements that can be evaluated quantitatively using various types of fire studies.

Pre-requisite(s):-

Text Book(s):

1. Dougal Dysdale, An Introduction to Fire Dynamics 3rd Edition, John Wiley and Sons, 2011.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Rasbach, D.J., et al., Evaluation of Fire Safety, John Wiley and Sons, 2004.
4. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
5. SNI, ASTM, NFPA, rules and standards

ENME804139 - FIRE PROTECTION IN PROCESS INDUSTRY (4 SKS)

Learning Objective(s):

This course will provide an understanding and scientific knowledge of fire protection systems in the process industry.

Syllabus :

Fire Hazard identification on Industry, Standard and applicable Law, Fire Protection in Industrial Processes, Evacuation Planning and Mitigation, and Modeling for Fire Hazard Prediction in Process Industries.

Text Book(s):

1. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME801140 - MATERIAL AND MANUFACTURING PROCESSES (4 SKS)

Learning Objective(s):

The course provides understanding and basic competence of theory, application method and product manufacturing processes that covers: working principle, process characteristics, process limitations, work and force due to the process, parameters that affects to the process and the relation of material with the process that needed for certain process.

Syllabus :

Manufacturing Process and Production Systems; Materials in Manufacturing; Theory and Method of Casting Processes; Theory and Method of Bulk Deformation Processes; Theory and Method of Metal Forming Processes; Theory and Method of Powder Metallurgy Processes; Theory and Method of Material Machining/ Cutting Processes; Theory and Method for Enhancing Manufactured Surface Quality; Theory and Method of Joining Processes; Theory and Method of Prototyping; Engineering Material Characteristics; The Relation between Process Characteristics and Material Characteristics; The Parameter Control of Process for Material; Assignment in Manufacturing Process and Material Selection for Market Needs.

Text Book(s):

1. Michael Ashby dan Kara Jhonson, *Materials and Design : Arts and science in material selection in product design*, Butterworth-Heinemann, 2002
2. Michael Ashby, *Material selection in Mechanical Design*, Butterworth Heinemann, 2005
3. John A. Schey, *Introduction to Manufacturing Processes*, McGraw-Hill, 1999
4. Degarmo, E. Paul, *Materials and Processes in Manufacturing*, Prentice Hall Int. Inc, 8th edition, 2005

ENME801141 - PRODUCT DESIGN AND DEVELOPMENT METHODOLOGY (4 SKS)**Learning Objective(s):**

Provide an understanding and mastery of the theory and methodology of design and product development include: planning, concept development, system design, detailed design, testing and screening, production ramp-up, in a series of factors to consider overall product development.

Syllabus :

Product Planning: Needs Identification Methods; Product Selection Method (Feasibility Study); Business Specifications: Concept Development and Selection; Aspects of Engineering in Product Development and Manufacturing (Process, Material, Thermal, Durability) Non- Technical Aspects in Product Development and Manufacturing; basic Design for Manufacturing and Assembly; Calculation of Economics of Product Development.

Text Book(s):

1. Karl T. Ulrich. *Product Design and Development*, 3rd edition, Mc.Graw Hill 2004.
2. Dieter, G.E., *Engineering Design*, 3rd edition, Mc.Graw Hill 2000

ENME802142 - DESIGNING AND MANUFACTURING TECHNOLOGY INTEGRATION (4 SKS)**Learning Objective(s):**

Provide an understanding of competence and capability in designing and manufacturing process by utilizing perancangan / includes latest design and manufacturing system CAD / CAM and reverse engineering and prototype development to improve efficiency and accelerate the production process, reduce errors, improve quality and reduce production costs.

Syllabus :

System Overview of CAD / CAM; Hardware & Software Systems CAD / CAM: Geometric Modelling: Type a mathematical representation of the model curve, surface and solid 3D modeling methods and manipulation of 3D models; exchange of data within and between sistem-CAD/CAM; CAD Laboratory Activity; Technology CNC; Tool Path Generation Method-CAM systems; Control 'quality of machining' (machined surface quality) in the system-CAM: Computer-Aided Process Planning CAPP; post-processing; Practice CAM: 3D geometry measurements, principles and measurement based Coordinate Measuring Machine (CMM), the method of filtration data, the identification of boundary features, modeling and manipulation of point-based 3D models, 3D models for the modularization of the prototype, prototype and rapidprototyping method, discretization model, principles and application of SLS and SLM.

Text Book(s):

1. Kunwoo Lee, *Principles of CAD / CAM / CAE*, Prentice Hall, 2003
2. Gandjar K, *Hand out CAD/ CAM*, DTMI, 2007
3. Connie L. Doston, *Fundamentals of Dimensional Metrology*, Delmar Learning, 2006
4. Ali K. Kamrani, Emad A Nasr, *Rapid Prototyping : Theory And Practice*, Birkhauser, 2006
5. Patri K. Venivinod, Weyin Ma, *Rapid Prototyping : Laser Based and Other Technologies*, 2003.

ENME803143 - MECHANICAL FAILURE (4 SKS)**Learning Objective(s):**

This course provides an understanding and competence about principles and modes of mechanical failure may occur and should be avoided so that should be considered in the design of mechanical, including buckling, Corrosion, fatigue, creep, melting, fracture, thermal, and wear.

Syllabus:

Theory and Buckling Mode (Torsional-lateral, Plastic, Dynamic), Theory and Corrosion mode (Metal, Non-Metal, Glass); Corrosion Prevention; Theory and Fatigue Failure Mode; Theory and creep mode; Theory and Melting Mode; Theory and Type of Fracture mode, Theory and the thermal failure mode; Theory and Wear mode; Failure Analysis and Prevention to: Buckling, Corrosion, Fatigue, creep, Melting, Fracture, Thermal, and Wear

Pre-requisite(s): Engineering Material, Basic Mechanical Design, Mechanical Design

Text Book(s):

1. Jack A Collins, *Materials Failure in Mechanical Design*, Wiley - Interscience, 1993
2. S. Suresh, *Fatigue of Materials*, Cambridge University Press, 1998

3. M Jansenn, J. Zuidema, Fracture Mechanics, VSSD, 2006
4. Arthur J. McEvily, Metal Failures : Mechanisms, Analysis and Prevention, 2013

ENME803144 - DYNAMICS OF MECHANICAL SYSTEM (4 SKS)

Learning Objective(s):

Provide an understanding and competence in the principles and methods of dynamic analysis of mechanical systems as an important input in the design process to produce a mechanical system that has a better dynamic resistance and also know the effects they impose on other systems that interact.

Syllabus :

Kinematic Systems: Theory and Principles of Dynamic Systems: Dynamic Modeling Method: Block Diagrams and State-Variable Model: Analysis on Time-Domain System: Analysis of the Frequency-Domain System; Vibration; Stability: Dynamic Balance: Dynamic Analysis of Mechanical Components; Modeling and Analysis control system.

Text Book(s):

1. Palm, Modelling, Analysis, and Control of Dynamic Systems, Wiley, 2006
2. Harold Joseph dan Ronald Huston, Dynamic of Mechanical System, CRC, 2002
3. Palm, System Dynamics, McGraw-Hill, 2007
4. Chapman, Stephen J., Essentials of Matlab Programming, Thomson Nelson, 2006

ENME803145 - COMPOSITE PRODUCT DEVELOPMENT (4 SKS)

Learning Objective(s):

Provide expertise and competence to students in the field of designing and manufacturing of parts / mechanical construction using composite materials. This course provides an understanding of composite materials, including the characteristics, testing, manufacturing process, and special applications in the engineering field.

Syllabus:

Composite Type, Material, Properties, Mechanics; Knowledge and Characteristics of Fiber Composite, Strength, Hardness, and the composite thermal expansion; Theory of Combination Fiber and Matrix; Matrix Composite Characterization; Laminar Theory On Axis and Off Axis; Composite Product Design, Composite Fabrication Technique ; Testing Method; Future Applications.

Pre-requisite(s): Engineering Materials, Mechanical Design, Design Assignment.

Text Book(s):

1. Brent Strong, Fundamentals Of Composites Manufacturing: Materials, Methods and Applications - Technology & Engineering - 2007
2. By Daniel Gay, Suong V . Hoa, Stephen W. Tsai Translated by Stephen W Tsai Contributor Suong V. Hoa, Stephen W. Tsai, Composite materials: Design and application, 2nd : CRC Press 2007
3. Soemardi, T.P. Diktat Mekanika komposit, Fabrikasi dan Testing. FTUI. 2003.
4. Composites ASM handbook No 21

ENME803146 - FINITE ELEMENT AND MULTIPHYSICS (4 SKS)

Learning Objective(s):

Provide a basic understanding and skills regarding the principles of modeling, solution techniques such as 'finite element method' and its application in cases of design and engineering analysis. The models studied included physical aspects of the problem in Thermal, elasticity (plates and shells), acoustic, and electromagnetic.

Syllabus :

The introduction of FEA (Finite Element Analysis); Fundamental FEA I (basic concepts and formulations FEA FEA) FEA Fundamentals II (failure modes, Dynamic Analysis, FEA Capabilities and limitations); Basic Finite Element Modeling: Modeling CAD for FEA; Building a Finite Element Model: Model simulation and interpretation of results; Thermal-Structural; Pressure-Structural; Electromagnetic-Thermal- Structural; Analysis of Thermal Actuator; Coating process: Key elements of Successful Implementation of Technology multiphysics; Introduction to CFD and Its Application.

Text Book(s):

1. William B J Zimmerman, Multiphysics Modeling with Finite Element Methods, World Scientific Publishing, 2006
2. Barry H V Topping, A. Bittner, Engineering Computational Technology, Civil Comp Press, Edinburgh, UK, 2002.
3. Indra Siswantara, Catatan Kuliah Teknologi Multiphysics, 2008

ENME803147 - TOY PRODUCTION DESIGN (4 SKS)

Learning Objective(s):

Understanding the basics and design development of educational products in the industry props, product education, and game props.

Syllabus:

Brainstorming and express the ideas and opinions, Innovation and Development Themes, Basics of Toy Product Design, Basic Design Engineering and Mechanical, Basic Theory Make Sketch, Process Modeling Sketch Image, Design Aesthetics, Theory of

Manufacturing and Selection of Materials for Viewer tool Games, Basic Theory Creation prototype, Portfolio Design, Presentation and Pitching Idea.

Pre-requisite(s): None

Text Book(s):

1. Karl Ulrich, Steven Eppinger, 2015, Product Design Development Flow, 6th Edition, McGraw Hill.
2. Donald A. Norman, 2005, Emotional Design, 1st Edition, Basic Books.
3. Michael Michalko, 2006, Thinkertoys : A Handbook of Creative Thinking Techniques, 2nd Edition, Ten Speed Press.

ENME803161 - MICROFABRICATION AND PRECISION MANUFACTURING (4 SKS)

Learning Objective(s):

In this course provides expertise of micro manufacturing process widely used in the making of MEMS (micro Electro mechanical system) at this time that has wide application of the biomedic system, sensors and micro-electronic devices (electronic devices). This course giving understanding of manufacturing techniques and basic structure mechanics in a product and also the micro-characterization of the process fabrication conducted in the laboratory. This course provides a basic competency of the principles in the design techniques which control the movement of the size or dimensions in a very small if compared with the size of the object that is designed and produced the correct design and the development machine and a precision mechanism

Syllabus:

Introduction to Engineering Micro Fabrication; Lithography: The design aspect, masks making, etching technique (And Wet Etching Dry Etching); Deposisi Engineering: Chemistry and Chemicals; Electroplating, Micromolding, Beam Processing; Microscaling consideration); Transport Processes and Metrology in the micro-scope; Lab Practice and Applications, Philosophy Precision Manufacturing; kinematic concept; Pro and contra Flexures Design; Materials for Precision Components; Self Calibration Concept; Manufacturing Process which is Important in Precision Manufacturing, Precision Instruments; Basic Concept of Tolerance on Dimensions and geometric. **Pre-requisite(s):** Basic mechanical design, Mechatronics, Design assignment, : Metrology and Measurement, Engineering Materials, Manufacturing Process and Materials Selection

Text Book(s):

1. Madou, M.J. Fundamentals of microfabrication: the science of miniaturization, CRC Press, 2002.
2. McGeough, J (Ed.), Micromachining of Engineering Materials, Marcel Dekker, 2002, ISBN 0-8247-0644-7
3. Mainsah, E., Greenwood J.A. and Chetwynd D.G. Metrology and properties of engineering surfaces, Kluwer Academic Publ., 2010
4. Gardner J.W. and Hingle H.T. (Ed.) From Instrumentation to Nanotechnology, Gordon and Breach Science Publishers, 1991, ISBN 2-88124-794-.
5. Korvink J.G. and Greiner A. Semiconductors for Micro- and Nanotechnology - An Introduction for Engineers, WILEY-VCH Verlag GmbH, 2002, ISBN 3-527-30257-3.
6. Mark J. Jackson, Microfabrication and nanomanufacturing. Taylor and Francis, 2006

ENME804148 - DESIGN FOR MANUFACTURE AND ASSEMBLY (4 SKS)

Learning Objective(s):

Provide knowledge, understanding and competence in the product design process which is considering, including factor and oriented on: material, manufacturing capability and assembling process. Therefore the product is expected to have made ease of manufacture and assembly.

Syllabus:

Review of the materials selection and processes, product design for manual assembly, design for automated assembly, PCB design for manufacture and assembly, machining process design, injection molding, sheet metal forming processes, die-casting.

Pre-requisite(s): None

Text Book(s):

Boothroyd, Product Design for Manufacture and Assembly 3rd Ed, CRC Press, 2010

ENME804149 - NOISE AND VIBRATION (4 SKS)

Learning Objective(s) :

This course provides competency to students to complete the issue of application of vibration on the mechanical structure of the construction, and plate or vessel (vessel), perform the calculation of vibration reducer system design, system and engine holder enhancing of production equipment. Finally students have to make basic vibration measurements; forecasts predicted the damage engine, the vibration analysis of the data signal and the vibration spectrum and carry out machine performance diagnosis based on data analysis of vibration data and other data related

Syllabus :

Mechanical vibration with Many Degrees Freedom; Vibration on the Structure Construction; Vibration on plate and body shell (Vibration Plate and Shell); Vibration Isolation; Designing Vibration Absorber; Engineering Vibration Measurement; Vibration spectrum analysis; Performance Diagnostic Machine.

Pre-requisite(s) : Numerical Computation, Mechanical Vibration, Maintenance and Machine Cond. Monitoring

Text Book(s) :



1. Jerry H.G., "Mechanical and Structural Vibrations", John Wiley, 2004
2. Demeter G.F., "Mechanical and Structural Vibrations", John Wiley, 1995
3. Kenneth G.M., "Vibration Testing: Theory and practice 2nd ed", Wiley, 2008
4. Werner Soedel, "Vibrations of Shells and Plates", 3rd edition - revised and expanded, Marcel Dekker, INC., 2004
5. Randall R.B., "Frequency Analysis", Brüel & Kjær, 1987
6. Jens T.B., "Mechanical Vibration and Shock Measurement", Brüel & Kjær, 1980

ENME804162 - LASER ASSISTED PROCESS (4 SKS)

Learning Objective(s):

Students are expected to understand knowledges related to fabrication process assisted by laser, and its direct application. Mahasiswa dapat memahami ilmu yang terkait dengan proses fabrikasi yang dibantu dengan teknologi laser, dan aplikasi serta penerapan langsung dari proses fabrikasi yang dibantu oleh teknologi laser.

Syllabus :

Dasar - Dasar Teknologi Manufaktur berbasis Laser; Proses Pembentukan dibantu Laser; proses *joining* dengan dibantu teknologi laser; *Laser Assisted Surface Engineering*; Jenis-Jenis Laser, Penerapan Teknologi Laser, Dasar- Dasar interaksi laser dengan material dan Klasifikasi Proses Material dengan Teknologi Laser.

Text Book(s):

1. A.M. Hasofer, V.R. Beck, I.D. Bennetts, Risk Analysis in Building Fire Safety Engineering, Elsevier Butterworth-Heinemann, 2007.
2. Ralph W King and John Magid, Industrial Hazard and Safety Handbook, ISBN: 978-0-408-00304-9
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME801150 - MANUFACTURING INFORMATION SYSTEM MANAGEMENT (4 SKS)

Learning Objective(s):

Provides understanding of the theory, method and application of information technology systems, management, and development of the concept of knowledge-based information systems (Knowledge Management System) and capable to apply in the manufacturing industry.

Syllabus :

Introduction to Information Systems; State of The Art Utilization Information System; Theory and System Methodology; Database Management Systems; System Design I: Overview functionality, enabling Technology (Automated Solution Assessments Quality, Multi Data Representation, Database Technology and XML); Design System II: (Database Design, Information Input, Output Information); Case Study: Documentation automation and Reporting System for Manufacturing; Introduction Knowledge Base Engineering, Concepts and Methodology in the KBE (System Specialists, Neural Network); KBE application..

Text Book(s):

1. Raymond McLeod Jr., *Strategic information Management : Challenges and Strategies in Managing Information System*; 3rd Edition, Butterworth-Heinemann, 2003.
2. Cortada, James. *Total Quality Management*, McGraw Hill Book Co.
3. Ake, Kevin et al. *Information Technology for Manufacturing : Reducing Costs and Expanding Capabilities*, CRC Press, 2003.
4. Cecelja, Franco, *Manufacturing Information and Data System : Analysis Design and Practice*, Butterworth-Heinemann, 2001.

ENME801151- MANUFACTURING SYSTEM AND PROCESSES (4 SKS)

Learning Objective(s):

Students are expected to know and be able to apply the conventional manufacturing process technology and non-conventional for the manufacture of a product and the parameters which influence it are devoted to the metal forming processes, machining, rapid prototyping process. In addition, knowing, and understanding the existing production systems in the industry.

Syllabus :

Materials in Manufacturing: Theory and Method of Casting Process (Metal Casting); Theory and Method of Bulk Formation Processes: Theory and Method of Formation Process Material Sheet (Sheet Metal Forming): Theory and Methods of Powder Metallurgy Process (Powder Metalurgy); Theory and Methods for Machining Processes / Cutting Materials: Theory and Methods of Product Surface Quality Improvement process: Concepts and methods of manufacturing systems.

Text Book(s):

1. Wagoner R., Chenot J.-L., *Fundamentals of Metal Forming*, John Wiley & Sons, Inc, 2003
2. Degarmo P., *Materials and Process in Manufacturing*, Prentice Hall, 2004
3. Schey J., *Introduction to Manufacturing Process*, McGraw-Hill, 2004
4. Thomas E Vollman, *Manufacturing Planning and Control*, McGraw Hill 1997
5. Stanley B. Gershwin, *Manufacturing System Engineering*, Prentice Hall, 1993
6. John M. Nicholas, *Competitive Manufacturing Management*, 1997

ENME802152 - AUTOMATION AND ROBOTICS (4 SKS)**Learning Objective(s):**

Automation and Robotics course discusses technology and application in the automation industry and the design and control the robot emphasizes: understanding the types of automation systems, particularly in the manufacturing industry and the mechanism, the design and development of automation system that emphasizes the 3 things: reliability, quality and cost and the understanding robot control system. Automation and Robotics Lectures given with the aim that students have an understanding in the implementation of technology Automation and Robotics, especially in the manufacturing industry.

Syllabus:

Automation System; Classification Type Manufacturing Automation machinery; Actuator; Sensor System; PLC Control System in the Manufacturing Automation machinery; Robot- cs: Definitions and Principles of Robot; Spatial Descriptions: Definitions and Principles, Methods and Applications Spatial descriptions; Forward Kinematics: Definition, Principles and The Forward Kinematics; Jacobians: Speed, explicit shape, definition and principle of inverse Kinematics; Dynamic: The form of explicit, Acceleration and inertia; Control system ronbotic: PID control, the Joint Space Control, Operational Control and Space Force Control; Robot Design Assignment.

Pre-requisite(s): None

Text Book(s):

1. Craig J., Introduction to Robotics 3rd ed, Prentice Hall, 2004.
2. Heath L., Fundamentals of Robotics, Theory and Applications, Prentice Hall, 1985.
3. Koren Y., Robotics for Engineer, McGraw Hill, Intl Edition, 1985.
4. Lentz K. W. Jr., Design of Automatic Machinery, Van Nostrand Reinhold, 1985.
5. Schilling R. J., Mikell P., Fundamentals of Robotics, Analysis and Control, Prentice Hall, 2000.
6. Kiswanto G., Otomasi dan Robotika, Diktat Kuliah Departemen Teknik Mesin, 2004.

ENME803153 - MACHINE VISION SYSTEM (4 SKS)**Learning Objective(s):**

Machine Vision Industry Subjects provides the understanding and competency of the principles, methods and applications monitoring the production process by using visual-based camera technology, image processing, for the purpose of introducing the feature: product identification, selection and product screening, and quality control. With the completion of this course, students have the ability to apply and develop the visual method of monitoring the production process in the industry for the purpose.

Syllabus:

Basic Machine Vision Method: Binary Image, Binary Morphology and Gray-Scale, Texture analysis; Identification Method feature; image Processing Method Smart / Intelligent, Image Processing System (Prolog); Control Equipment / Instruments Interface (Instruments, Signal, Protocol, PLC) ; Method Introduction Color image; Machine Vision Applications.

Pre-requisite(s): Mechatronics

Text Book(s):

1. J.R. Parker, Algorithms for Image Processing and Computer Vision 2nd ed, Wiley, 2010
2. Butcheloor B. G., Whelan P. F., Intelligent Vision System for Industry, Springer, 2012
3. E.R. Davies, Machine Vision : Theory, Algorithm, Practicalities, Morgan Kauffman, 2004
4. Micheul S, Lawrence O’Gorman, Michael J S Practical Algorithms for Image Analysis : Description, Examples and Code, , Cambride Univ. Press, 2000
5. Rafael Gonzales, et.al, Digital Image Processing using Matlab, McGraw Hill, 2010.
6. A.S. Baskoro, Handout Sistem Machine Vision, Diktat kuliah, 2011.

ENME803154 - QUALITY AND PRODUCTION MANAGEMENT SYSTEM (4 SKS)**Learning Objective(s):**

Provides knowledge, understanding and ability to perform management, analysis and improvement of production systems in the manufacturing industry with the principles of efficiency and effectiveness, and able to understand and implement and develop policies and procedures are needed to improve and control the various processes.

Syllabus :

Introduction to Manufacturing Systems, Manufacturing Principles, Resources, Production Process and Production Organization, Production Lay-Out, Design, Scheduling and Production Process Control; Productive Maintenance, Logistics and Inventory; Engineering Quality, Quality Control, Quality Function Deployment (QFD) , Total Quality Management; Quality Management

System (8 Quality Management Principles, International Standard Quality Management System: ISO 9001, ISO 9004, ISO TS 16949, the International Management System Standard: ISO 14001, OHSAS 18001); System And Process Improvement: Cause - Effect Analysis, FMEA (Failure Mode and Effect Analysis), Lean Six Sigma.

Pre-requisite(s): None

Text Book(s):

1. Hitomi, Katsundo. Manufacturing System Engineering. Taylor & Francis. 2001
2. TQM : A Cross Functional Perspective, Rao, CARR, Dambolena, Kopp, Martin, Rafii, Schlesinger, John Willey, 1996
3. TQM, Text, Cases and Readings, Joel E. Ross, St. Lucie Press 100 E. Linton Blvd Suite 403 B Delray Beach, FL 33483

ENME803174 - RISK MANAGEMENT (4 SKS)

Learning Objective(s):

Students can explain and apply risk management in a risk assessment.

Syllabus:

Introduction to risk management, Value at Risk --VaR Risk measures for various asset classes, Monte Carlo Simulation, VaR Validation and Extremes, Regulatory Environment 25 years of risk related regulations, Multifactor models Discussion of multifactor analysis, Review of industry leading risk management system, Operational Risk and its Basel II requirements.

Text Book(s):

1. Jorion, Philippe, Value at Risk: The New Benchmark for Managing Financial Risk, 3rd edition, McGraw-Hill, 2007
2. Roger Lowenstein, When Genius Failed, Random House, 2000

ENME804155 - CAD/CAM (4 SKS)

Learning Objective(s):

This lecture will discuss about technology of CAD, CAM, Integration of CAD / CAM application in the industry and the emphasis on: the principles modeling and surface curve geometry (Geometric modeling), design of 2D and 3D models with computer assisted. The principle of data exchange between CAD/CAM systems also tool path design using computer for prismatic and sculptured model. Lectures CAD / CAM are provided with the aim that students have the understanding and applying technology of CAD / CAM: starting the process from design to production process with the computers assistance.

Syllabus:

Overview of CAD / CAM System; Hardware & Software System of CAD / CAM; Interactive Tools and Computer Graphics Concepts, Geometric Modeling: Type & Representation of mathematical model Curve, Surface & Solid ; Data Exchange in CAD / CAM system; Manufacturing Processes: Manufacturing Process Review Type and Parameter Calculation machining, Lab. practice of CAD; CNC Technology; Tool Path Generation Method in the CAM system; Control 'quality of machinery' in the CAM system; Computer Aided Process Planning-CAPP; Postprocessing; Lab. practice of CAM.

Pre-requisite(s): None

Text Book(s):

1. Kiswanto G., Handout CAD/CAM, Diklat kuliah, 2004.
2. Choi B. K., Jerard R. B., Sculptured Surface Machining,
3. Zeid, I., CAD/CAM Theory and Practice, McGraw-Hill, 2009.
4. Chang, T. -C., Computer Aided Manufacturing, 3rd ed, Prentice-Hall, 2005.
5. Korem, Y., Computer Control of Manufacturing Systems, McGraw-Hill

ENME804156 - MANUFACTURING PERFORMANCE ASSESMENT (4 SKS)

Learning Objective(s):

Provides knowledge about the basic concepts of performance assessment of manufacturing industry relating to product performance, process, manufacturing system and its relation to manufacturing excellence. At the end of this course, students are expected to understand the methodologies and assessment tools manufacturing performance and are able to identify, assess and analyze the performance of the manufacturing industry increase.

Syllabus:

Introduction, Traditional Performance Methodology & Tool: Dupont Financial Performance, Basic Performance Measurement process & tools: Data collection techniques, chart, graph & diagram, Process Improvement methodologies & tools: Process Capability, Measurement System Analysis (MSA), QFD, FMEA, six sigma & lean six sigma, Industry specific/ generic standards & best practices, Manufacturing Maturity model concept & measurements, Case study of Industrial performance Measurement (assignment & evaluation)

Text Book(s):

1. US Departement of Energy, United Sates of America, Performance Based Management, 2005 Oak Ridge Associated Universities,. "How to Measure Performance, A Hand Book of Techniques and Tools"
2. "World Class Manufacturing Performace Measures"
3. Harold T.Amrine, John A.Ritchey, Prentice Hall International Edition, "Manufacturing Organization and Management"
4. Will Kaydos, Productivity Press Portland Oregon, " Measuring, Managing and Maximizing Performance"

ENME801163 - VEHICLE ENGINEERING AND HEAVY DUTY EQUIPMENT (4 SKS)**Learning Objective(s):**

This course provides the latest technology from the four-wheeled passenger vehicle, especially with covering all aspects of engineering in a vehicle. Lectures given vehicle engineering with the aim that students have basic competence to do the engineering on the four-wheeled passenger vehicle in particular.

Syllabus :

Vehicle Kinematics & Dynamics; mover and transmission system; Breaking Systems, Wheel and Suspension; Security System: Active and passive at the time experiencing issues.

Text Book(s):

1. Bosch Automotive Handbook, Sixth Editions, 2006
2. Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, 2004
3. Heisler, Heinz. Advanced Vehicle Technology, 2004
4. Hermann, Hans. SAE Handbook of Automotive Engineering, 2004
5. Milliken, William F., Douglas L. Milliken, Maurice Olley, Chassis Design : Principles and Analysis, 2004
6. Pacejka, Hans B. Tire & Vehicle Dynamics, SAE, 2006

ENME801164 - PRIME MOVER AND POWERTRAIN SYSTEM (4 SKS)**Learning Objective(s):**

Students have the competency and skill in the principles and theory of prime mover including internal combustion motor, electric motor, hybrid motor which are connected to the powertrain system; understand and are able to calculate the construction and design.

Syllabus :

Combustion motor technology; reciprocating/rotary piston engine; electric motor technology (AC/DC motor); hybrid motor system; serial/parallel hybrid; transmission system: MT, AT, DCT, CVT; battery technology

Text Book(s):

1. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 1989
2. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.
3. Bosch Automotive Handbook, Sixth Editions, 2006
4. Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, 2004
5. Heisler, Heinz. Advanced Vehicle Technology, 2004
6. Hermann, Hans. SAE Handbook of Automotive Engineering, 2004

ENME802165 - VEHICLE FRAME AND BODY ENGINEERING (4 SKS)**Learning Objective(s):**

Provides the understanding of several concepts related to design and analysis of vehicle frame such as:

- A brief understanding in the history of vehicle design development
- Understanding the different possible scenarios for vehicle design and interactivity of the process in the design and manufacture of vehicles, as well as various types of vehicle structure and its use.
- Understand how the load can be analyzed simply and with the use of computers as well as a simple structural analysis that highlights the processes involved in vehicle structures.
- Understanding the basic concepts related to the aerodynamic vehicle body and the basic calculations required in the form of an aerodynamic vehicle design

Syllabus :

Introduction to Innovation and breakthrough discoveries in the field of automotive and industrial development of the automotive world today. Understanding the concept of loading on the vehicle structure, various types of chassis, structural analysis with a simple method of surface structure (Simple Structural Surface method) and method of computing the skeletal structure. aerodynamic force, reducing the lift force (drag force reduction), stability and concept of calculation of the vehicle body dynamics computation

Text Book(s):

1. Heinz Heisler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 0 7680 10713.
2. Brian Cantor, Patrick Grant and Colin Johnston, "Automotive Engineering Lightweight, Functional, and Novel Materials", Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN 978-0-7503-1001-7.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978-1-4020-8676-2.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.
5. Nick Tucker and Kevin Lindsey, "An Introduction to Automotive Composite", Rapra Technology Limited, ISBN: 1-85957-279-0.
6. Jason C. Brown, A. John Robertson, and Stan T. Serpento, "Motor Vehicle Structures: Concepts and Fundamentals", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 0750651342
7. Liang Yun · Alan Bliault · Johnny Doo, WIG Craft and Ekranoplan, "Ground Effect Craft Technology", ISBN 978-1-4419-0041-8 e-ISBN 978-1-4419-0042-5, DOI 10.1007/978-1-4419-0042-5, Springer New York Dordrecht Heidelberg London.
8. Matthew Huang, "Vehicle Crash Mechanics", CRC Press LLC, International Standard Book Number 0-8493-0104-1.
9. Ahmed A. Shabana, Khaled E. Zaaza and Hiroyuki Sugiyama, "Railroad Vehicle Dynamics a Computational Approach", CRC Press is an imprint of the Taylor & Francis Group, ISBN 978-1-4200-4581-9.

ENME803166 - VEHICLE CONTROL SYSTEM (4 SKS)**Learning Objective(s):**

Students understand the basic features of the vehicle control system that has the ability to;

- Describes a simple method for the analysis of vehicle suspension systems and components;
- Describes the vehicle suspension system design requirements and how to achieve it;
- Analyze the various factors and issues that affect the design of suspension of driving;
- Understand the mechanics of the vehicle wheel;
- Describes recent developments in control of the braking system and braking system design and material needs an efficient;
- Analyze the influence of the steering system characteristics to the vehicle motion

Syllabus :

Introduction of the role of vehicle suspension systems, factors that affect the design, definitions and terminology in vehicle suspension systems, suspension mobility mechanisms, different types of suspension, kinematics analysis, the analysis center of rotation (roll center analysis), geometric style as well as lateral, suspension components. The basis of the braking system. Regulation, function and terms of use brake system, brake system components and configurations as well as the kinematics of the braking system. Consideration of adhesion force proportional to the brake system and braking efficiency. Deformation, lateral force and slip angle on the tire when the vehicle is running. Penikungan characteristics (cornering characteristics) according to Fiala theoretical approach to the mathematical model and the effect is due to air pressure in tires.

Text Book(s):

1. Heinz Heisler, "Advance Vehicle Technology", Society of Automotive Engineers Inc. ISBN 0 7680 1071 3
2. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978- 1-4020-8676-2.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: System Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8673-1 e-ISBN: 978-1- 4020-8675-5.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.

ENME803167 - MODERN VEHICLE TECHNOLOGY (4 SKS)**Learning Objective(s):**

Students understand the concept of manufacturing technology and control systems on the vehicle so as to: • Analyze the condition of current technological advances to make fundamental changes in vehicle design a sustainable future.

- Design process to create an automatic control system that helps in controlling the vehicle.
- Designing vehicles with electronic control systems that can improve vehicle performance.
- Describes the integration of vehicle control systems and mechanical/electrical interaction possibilities for the design of future vehicles.

Syllabus:

Knock control, Linear solenoid idle speed control, Sequential fuel injection, Distributorless ignition, Self-diagnosis for fail-safe operation, Crankshaft angular position measurement for ignition timing, Direct mass air flow sensor, Variable valve phasing, teknologi kendaraan Hybrid Electric Vehicles and Electric Vehicle.

Text Book(s):

1. Julian Happian-Smith, " An Introduction to Modern Vehicle Design", Butterworth- Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 07506 5044 3.
2. Heinz Heisler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 07680 1071 3.
3. Fuhs, Allen E., "Hybrid vehicles and the future of personal transportation", CRC Press, Taylor & Francis Group, ISBN-13: 978-1-4200-7534-2, ISBN-10: 1-4200- 7534-9.
4. Lino Guzzella and Christopher H. Onder, "Introduction to Modeling and Control of Internal Combustion Engine Systems", Springer-Verlag Berlin Heidelberg, ISBN 978-3-642-10774-0 e-ISBN 978-3-642- 10775-7, DOI 10.1007/978-3-642-10775-7, Library of Congress Control Number: 2009940323.
5. Iqbal Husain, "ELECTRIC and HYBRID VEHICLES Design Fundamentals", CRC PRESS Boca Raton London New York Washington, D.C., ISBN 0-203-00939-8 Master e-book ISBN, International Standard Book Number 0-8493-1466-6 (Print Edition), Library of Congress Card Number 2002041120.
6. Ali Emadi, "Handbook of Automotive Power Electronics and Motor Drives", Taylor & Francis Group, CRC Press is an imprint of Taylor & Francis Group, ISBN 0-8247-2361-9.
7. Nicolas Navet and Françoise Simonot- Lion, "Automotive Embedded Systems Handbook", CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN-13: 978-0-8493-8026-6, ISBN-10: 0-8493-8026-X
8. Paul Nieuwenhuis and Peter Wells, "The automotive industry and the environment A technical, business and social future", Woodhead Publishing ISBN 1 85573 713 2, CRC Press ISBN 0-8493-2072-0, CRC Press order number: WP2072.
9. Simon Tung, Bernard Kinker, and Mathias Woydt, "Automotive Lubricant Testing and Advanced Additive Development", ASTM 100 Barr Harbor Drive PO Box C700, West Conshohocken, PA 19428-2959, ISBN: 978- 0-8031-4505-4.
10. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Oxford Brookes University, Oxford, UK, Acenti Designs Ltd., UK. ISBN 0-470-85163-5.

ENME803195 - OIL AND GAS DRILLING EQUIPMENT (4 SKS)**Learning Objective(s):**

Provides additional insights regarding the implementation of basic knowledge of engineering competence that is at the core of

oil and gas drilling techniques. Competencies expected of graduates capable of developing the engine with value added technical knowledge of oil and gas drilling equipment that is ready to be trained and shaped to be easily and immediately adapt to work without the awkwardness of the world's E / P oil and gas fields in general and in particular oil and gas drilling. Thus it has the advantages of graduates and a wider choice in the real world of work later. Objectives and learning outcomes to be achieved:

1. Enabled students to know the basic tools and their functions and how each is needed in an oil and gas drilling operations.
2. Students capable of explaining the technique of oil and gas drilling operations and its other related aspects such as equipment used, safety issues, safety equipment, emergency and environmental issues.
3. Students have a pretty good understanding of the knowledge of drilling equipment and its operation so as to participate in an oil and gas drilling operations with confidence and readiness to increase knowledge and skills later on after graduation.

Syllabus:

Intro to oil / gas well, oil / gas Exploration, exploitation and production, drilling rig, the terminology, the problem of drilling, drilling fluid, drilling oil and gas in the system, hoisting system equipments, equipments rotating system, circulating system equipments, power system equipments, blowout prevention system equipments, well design, equipments and operations for safety and efficiency, process and equipments for cementing, drilling preparation, drilling operations, drilling and process problems (drill string vibration and whirling, collar failure, etc.) artificial lift methods and equipments, visit to the field of oil and gas drilling.

Text Book(s):

1. Don A. Gorman, Jerry W. Meyer, "Drilling Equipment and Operations", Action Systems Inc., Dallas, Texas - USA.
2. Adam T. Bourgoyne, Martin E. Chenevert, et. al., "Applied Drilling Engineering", Society of Petroleum Engineers, Richardson, Texas - USA.
3. Nguyen J.P., "Drilling-Oil and Gas Field Development Techniques", Institut Français du Pétrole Publication, 1996
4. Kermit E. Brown, "The Technology of Artificial Lift Methods", Volume 2a, Petroleum publishing Co., 1980
5. Amanat U.C., "Oil Well Testing handbook", Elsevier, 2004
6. Amanat U.C., "Gas Well Testing handbook", Elsevier, 2004

ENME804168 - RAILWAY VEHICLE ENGINEERING (4 SKS)**Learning Objective(s):**

Provides the knowledge and design of rail vehicle.

Syllabus:

Engineering and economic analysis of rail vehicles; body structures and rail vehicles; structural analysis of flat car; coupler analysis; electrical and pressurized water; analysis and modeling of the bogie; axle; wheel; brake and pivot; suspension system and driving quality; dynamic load analysis; fatigue and cracks in rail vehicles; models of rail vehicles and track geometry; modeling components of rolling stock; response rail vehicle on the track tangent; lateral stability of the rail vehicle on the track tangent; response rail vehicle on a curved trajectory; wheel wear; rail vehicle dynamics.

Text Book(s):

1. Simon Iwnicki, handbook of railway vehicle dynamics, CRC Press, Taylor & Francis Group, 2006.

ENME804197 - MATERIAL HANDLING EQUIPMENT (4 SKS)**Learning Objective(s):**

Provides expertise and competence to students in the field of design and development of lifting equipment and construction equipment

Syllabus:

Introduction and Scope of Construction Equipment; Tractor, Bulldozer, Dump Truck and shovel; Construction Equipment Mechanical Concept; Heavy equipment system: Pneumatic and Hydraulic; Basic Machine-lifting machinery and materials transporter; Cranes, hoist and conveyor; forklift: Moving Walks, Escalators, and Elevators

Pre-requisite(s): Mechanical Design, Design Assignment

Text Book(s):

1. ASME. Handbook of Materials Handling.
2. Mc.Guiness. Mechanical and Electrical Equipment for Building.

ENME804198 - AIRCRAFT STABILITY AND CONTROL (4 SKS)**Learning Objective(s):**

Provides the students with the knowledge and ability in analyzing the aircraft (A/C) stability and control.

Syllabus:

Systems of Aircraft Axes and Notation, Aircraft Static Equilibrium and Trim, The Equations of Aircraft Motion, Aircraft Longitudinal Dynamics, Aircraft Lateral-Directional Dynamics, Aircraft Maneuverability, Aircraft Stability, Aircraft Flying and Handling Qualities, Aircraft Stability Augmentation, Aircraft Aerodynamic Modelling, Aircraft Aerodynamic Stability and Control Derivatives

Pre-requisite(s) -

Text Book(s) :

1. Cook, Michael V., Flight Dynamics Principles, Elsevier Aerospace Engineering Series, 2007.

2. Russell, J.B., Performance and Stability of Aircraft, Butterworth Heinemann, 2003.
3. Von Mises, Richard, Theory of Flight, Dover Books on Aeronautical Engineering, 1959

ENME801179 - ADVANCED THERMOFLUIDS (4 SKS)

Learning Objective(s):

Students are expected to understand the concepts of mass, momentum, heat, work, energy, and entropy in the mechanics of thermofluid. Understanding the basic principle of hydrostatics, flow measurement, identification of thermofluids system or controlled volume and flow from mass, momentum, heat, and work which are related to the given problems. Understanding of lift force and drag force. Using the 1st and 2nd Laws of Thermodynamics in the thermofluids system.

Syllabus :

Introduction to thermofluids, hydrostatic, control volume approach, Bernoulli equation, streamlined curves, the basic concepts of thermodynamics, the relationship properties and ideal gases, application of the first and second law of thermodynamics, temperature, entropy, entropy of use, fuel, control volume analysis, steady flow, gas turbines and jet engines.

Pre-requisite(s) -

Text Book(s):

1. Cengel, Y.A. & Boles, M.A. Thermodynamics: An Engineering Approach
2. Homsy, G.M.(Ed.) Mechanics of Fluids
3. Moran, M.J. & Shapiro, H.N. Fundamentals of Engineering Thermodynamics
4. Nakayama, Y.; & Boucher, R.F. Introduction to Fluid Mechanics
5. Rogers, G.F.C. & Mayhew, Y.R. Engineering Thermodynamics
6. Samimy, M., Et Al. A Gallery of Fluid Motion
7. Sonntag, R.E., Borgnakke, C., & Van Wylen, G.J. Fundamentals of Thermodynamics
8. Van Dyke, M. An Album of Fluid Motion

ENME801180 - MARITIME RESOURCES AND TECHNOLOGIES (4 SKS)

Learning Objective(s):

This course provides an understanding of maritime resources and opportunities, as well as risks related to the exploited potentials. Students will learn knowledges of formation, exploration and production of maritime resources: not only oil and gas, but also other minerals, and ocean flora and fauna, including its impact on environmental sustainability.

Syllabus :

Oil and gas from the ocean, seabed mining, energy from the melting of ice, ocean energy, ocean flora and fauna, marine environmental sustainability.

Pre-requisite(s) -

Text Book(s):

1. Research Council National Research Council, NEW Mining in the Outer Continental Shelf and in the Deep Ocean, University Press of the Pacific, 2005
2. Arthur H. Johnson, Michael D. Max, William P. Dillon, Natural Gas Hydrate - Arctic Ocean Deepwater Resource Potential, Springer, 2013
3. Khaligh, Alireza and Onar, Omer C., Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems, CRC Press, 2009

ENME802181 - MARITIME ENGINEERING AND MANAGEMENT (4 SKS)

Learning Objective(s):

This course provides knowledge about technologies for ocean transportation and the application of ocean-based energy sources. This course also aims to equip students with understanding of maritime opportunities that can be developed with the use of technology.

Syllabus :

Classification of ship based on its function, aspects to consider in ship designing, history of development of off-shore structure, ocean environment, types of off-shore structure: fixed design and floating design, mooring and anchoring system, force calculation of off-shore structure, FPSO

Pre-requisite(s) -

Text Book(s):

1. International Energy Authority Renewable Energy Technology Deployment (IEA-RETD),
2. Offshore Renewable Energy: Accelerating the Deployment of Offshore Wind, Tidal, and Wave Technologies., IEA-RETD 2012.
3. Chakrabarti, Handbook of Offshore Engineering, Elsevier. 2007

ENME803182 - OCEAN ENERGY (4 SKS)

Learning Objective(s):

This course provides knowledge about technologies and principles related to the design of renewable ocean energy system

Syllabus :

Introduction to renewable ocean energy, introduction to wind turbine, tidal system and tidal energy system, OTEC, ocean flows, methods of economic/financial assessment for off-shore renewable energy system, wind energy, momentum theory and the limit of wind power output, tidal flow and its conversion to mechanical energy, description of wave energy sources, instruments of wave energy and instruments for simulation.

Pre-requisite : -

Text Book(s):

1. Twidell, J. and Weir, T., "Renewable Energy Resources. Second Edition", Taylor and Francis Group, 2006.
2. Boyle, G., "Renewable energy power for a sustainable future, Second Edition", Oxford University Press, 2005.
3. Walker J and Jenkins N, "Wind Energy Technology", Wiley Unesco Energy Engineering Series, 1997.
4. Manwell JF, McGowan, JG and Rogers, AL., "Wind Energy explained: Theory, Design and Application", Wiley. 2nd Edition. ISBN0-470-01500-4, 2010
5. Cruz, J., "Ocean Wave Energy: Current Status and Future Perspectives", Springer-Berlin, 2007.
6. Falnes, J., "Ocean Waves and Oscillating Systems: Linear Interactions Including Wave-Energy Extraction", Cambridge University Press, Cambridge, 2002.
7. Baker AC, "Tidal Power", Peter Peregrinus Ltd, 1981.

ENME803183 - MARINE AND OFFSHORE STRUCTURE (4 sks)**Course Objective :**

Provides the knowledge, understanding of the theory and principles of building offshore include the type, function, and offshore construction technology and techniques in performing design structure.

Syllabus :

Types of Offshore; Construction and Offshore Structures; Calculation of Style and Power Offshore: Safety Requirements; Construction Semi-submersible; Single Buoy Mooring; FPSO; Offshore Maintenance and Repair.

Pre-requisite : -

References :

1. Cliff Gerwick, Construction of Marine and Off-shore Structures, CRC Press 1999
2. Subrata Chakrabarti, Handbook of Offshore Engineering, Elsevier Science, 2005
3. Yong Bai, Marine Structural Design, Elsevier Science, 2003

ENME803184 - SEA TRANSPORT AND PORT MANAGEMENT (4 sks)**Course Objective :**

Provides the knowledge and understanding of various management approaches, maritime transport and port activities which also include risk factors, safety, and economy.

Syllabus :

Sea Transport Demand Trend: Marine Transportation Market Research; Inter Mode Transport System; System loading and unloading, Types of Sea Transport, Warehousing and Storage Cargo Systems, Systems Agency, Survey Charge, Corporate Sailing economic calculation, Customs.

Pre-requisite : -

References :

1. P. Lorange, Shipping Management, Institution for shipping Research.
2. Patrick Alderton, Reeds Sea Transport : Operation and Management, Adlard Coles, 2008
3. Patrick Alderton, Port Management and Operations, Informa Business Publishing, 2005
4. Svein Kristiansen, Maritime Transportation : Safety management and Risk analysis, Butterworth-Heinemann, 2004
5. M. Stopford, Maritime Economics, Routledge, 1997
6. House, D.J, Cargo Work for Maritime Operation, Butterworth Heinemann, 2005

ENME803185 - MARITIME LAW AND REGULATION (4 sks)**Course Objective :**

Provides knowledge and understanding of the laws and regulations on maritime activities both nationally and internationally.

Syllabus :

Introduction of maritime law; Regulation of Marine Pollution Prevention and Control; SOLAS; Prevention of Collisions Regulations; ISM Code; Statutory Rules; Passenger Ship Regulations; Tanker Regulations; Offshore Regulations: Accident Rescue Regulations; Other IMO rules. Accident prevention regulations; Risk assessment and analysis.

Pre-requisite : -

References :

1. International Convention for the Prevention of Pollution From Ships (MARPOL), International Maritime Organisation Publications

2. International Regulations for Preventing Collisions at Sea (COLREG), International Maritime Organisation Publications
3. [International Convention for the Safety of Life at Sea \(SOLAS\)](#), International Maritime Organisation Publications
4. International Safety Management Code (ISM Code) Guide Book, International Maritime Organisation Publications
5. Churchil R.R. dan Lowe A.V, The Law of the Sea, MUP 1999

ENME804186 - SPECIAL SHIP PROJECT (4 sks)

Course Objective :

Provides the knowledge, understanding of ship design for special purposes.

Syllabus :

Typology and special ship purposes; Material to special Ship, Design Considerations; Calculation of loading; Calculation of Ship Quantities; Computation Structures: Propulsion Systems; Motion System; Safety and Navigation System; Stability Calculation.

Pre-requisite : -

References :

1. Lars Larsson dan Rolf Eliasson, Principles of Yacht Design, International Marine/Ragged Mountain Press, 2007
2. Dave Gerr, The Elements of Boats Strength, International Marine/Ragged Mountain Press, 1999
3. Norman L. Skene, dan Marnard Bray, Elements of Yacht Design, Sheridan house, 2001
4. Steve Killing dan Doug Hunter, Yacht Design Explained : A Sailors Guide to the Principles and Practices of Design, W.W Norton and Company, 1998
5. S. Sleight, Modern Boat Building, Conway Maritime Press.

ENME804187 - SHIP PRODUCTION MANAGEMENT (4 sks)

Course Objective :

Provides knowledge and understanding of the various shipyard management and technique.

Syllabus :

Shipyard Layout; Ship Process Production; Steel Stock Yard Planning; Crane Calculation: Jamorang Calculation At Each Stage Production: Make Work Schedule: Work Break Down Structure; Integrated Hull Outfitting and Painting; Advanced Outfitting; Group Technology Methods for Ship Production; Ship launching; Ship trials.

Pre-requisite : -

References :

1. D.J. Eyres, Ship Construction, Butterworth- Heinemann, 2007
2. R.Shenoi, Ship Production Technology, Univ. Of Southampton.
3. National Research Council, Shipbuilding Technology and Education, National Academy Press, 1996

ENME804188 - MARITIME ENERGY MANAGEMENT (4 SKS)

Learning Objective(s) :

This course provides an understanding about energy optimization analysis with minimum fuel consumption. Additionally, it also provides optimization analysis with minimum initial energy

Syllabus :

Principle and regulation of maritime energy, planning and operation of an efficient ship, energy management for off-shore structure, energy management for port, renewable energy, huma resources aspect of energy management.

Pre-requisite(s) : -

Text Book(s) :

1. Hongyi Lai, "Asian Energy Security: The Maritime Dimension", Palgrave MacMillan, 2009
2. Steve Doty, Wayne C. Turner, "Energy Management Handbook 8th Ed.", Fairmont Press, 2012
3. Petrecca, Giovann, "Energy Conversion and Management: Principles and Applications," Springer, 2014

ENME804189 - MARITIME SAFETY (4 SKS)

Learning Objective(s) :

Provides knowledge and understanding related to the safety via regulations, management, and development of any forms of maritime transportation technology.

Syllabus :

SOLAS: Provisi Umum, konstruksi, alat keselamatan, radio komunikasi, navigasi keselamatan, pengangkutan barang, manajemen untuk keselamatan operasi kapal, MARPOL Annex I-V peraturan untuk pencegahan polusi, keamanan maritim; ancaman perdan-

gangan maritim, ancaman terhadap pengapalan, evolusi keamanan maritim, implementasi ISPS Code, perencanaan keamanan.

Pre-requisite(s): -

Text Book(s):

1. Jones. S. Maritime Security: A practical Guide, the nautical institute 2012
2. Consolidate Edition, MARPOL, International Maritime Organization, 2006
3. Consolidate Edition, SOLAS, International Maritime Organization, 2004

ENME804190 - ADVANCED WELDING ENGINEERING (4 SKS)

Learning Objective(s):

Provides knowledge, understanding of the theories, principles and design as well as the assessment of the quality of welding and welding applications.

Syllabus:

Introduction; Welding inspector qualification; processes and welding equipment, Destructive test; Non-destructive testing; Welding inspector responsibilities; Welding procedures and welder qualifications; welding design applications; residual stress and deformation; welding symbols, welding design, material engineering in welding, fabrication welding applications in industry.

Pre-requisite(s) : -

Text Book(s) :

1. Sindo Kou, Welding Metallurgy, 2nd Edition, Wiley, 2002.
2. ASME Section IX, Welding and Brazing Qualifications
3. AWS D1.1., Structural Welding (Steel)
4. Technical Manual TM 5-805-7. Welding Design, Procedures and Inspection Headquarters, Department of the Army.1985
5. Lloyds Register. Welding Procedures, Inspections and Qualifications.

MAGISTER TEKNIK MESIN FAST TRACK

For capable students who wish to continue their undergraduate study to Master Program in Mechanical Engineering via the Fast Track program, a credit transfer is allowed up to 22 sks. From the 22 sks, it is broken down into: 14 sks from the core subjects and another 8 sks from the elective subjects.

Transferrable core subjects and elective subjects are those admitted and are listed as options in the study program of Master in Mechanical Engineering.

Listed below are the requirements for students undertaking the Fast Track Program:

1. He/she must declare his/her intention in undertaking the Fast Track Program by writing an application letter to the head of the Department of Mechanical Engineering by also attaching a study plan in the form of subjects planning in the 6th-8th Semester (during the undergraduate degree) and in the 1st-4th Semester (during the Master Program) based on his/her specialization. This letter must be submitted by the end of the 5th Semester of his/her undergraduate degree course in Mechanical Engineering or Naval Architecture and Marine Engineering.
2. He/she must have an excellent academic performance, shown by the cumulative GPA (Grade Point Average, Bahasa Indonesia: IPK) of at least 3.2 in the 5th Semester and have passed all basic subjects.
3. He/she must have a guarantor and or a confirmed scholarship scheme to finish his/her undergraduate degree and master degree with the Fast Track Program.
4. He/she must declare his/her intention of undertaking the academic program under the Fast Track scheme in full-time.
5. If his/her application is accepted by the head of the Department/study program, then he/she must discuss with his/her academic advisor to finalize the study plan in the undergraduate degree and master degree program

The student of undergraduate degree program who have been accepted to enroll in the Fast Track program by the ehad of the Department needs to adjust his/her plan of taking which subjects in the 7th and 8th semester, especially by considering the available core and elective subjects available in the Master Degree Program according to his/her specialization.

