

FAKULTAS TEKNOLOGI INDUSTRI
FACULTY OF INDUSTRIAL TECHNOLOGY

Program Studi <i>Department</i>	PROGRAM SARJANA TEKNIK ELEKTRO <i>DEPARTEMENT OF ELECTRICAL ENGINEERING</i>
Jenjang Pendidikan <i>Programme</i>	SARJANA <i>BACHELOR</i>

Kompetensi Lulusan	• Menguasai pengetahuan di bidang Teknik Elektro, khususnya dalam bidang keahlian Teknik Sistem Tenaga, Telekomunikasi Multimedia, Elektronika, Teknik Sistem Pengaturan, dan Teknik Komputer-Telematika. • Mampu mengembangkan identifikasi, formulasi, dan analisis permasalahan dalam bidang Teknik Elektro sesuai bidang lingkup keahliannya masing-masing. • Memiliki kompetensi dan keahlian di bidang Teknik Elektro yang bermoral, berdaya saing tinggi, serta mampu mengembangkan, meningkatkan, dan memajukan IPTEK, memberi andil pada penerapan IPTEK, sehingga bermanfaat bagi kepentingan masyarakat
Graduate Competence	• <i>Mastering knowledge in technical field of Electrical Engineering, especially in the field of Power System Engineering, Telecommunications of Multimedia, Electronic Engineering, Network of Multimedia, Control System Engineering, and Computer Engineering-Telematics</i> • <i>Have capability to do identification, formulation, and analysis of the problems in electrical engineering fields.</i> • <i>Have highly competency and expertise in the technical field of Electrical Engineering with good personality, highly competitive, professional and able to develop, enhance, improve the science technology, and high contribution in its implementation.</i>

STRUKTUR KURIKULUM/COURSE STRUCTURE

No.	Kode MK Code	Nama Mata Kuliah (MK) Course Title	sks Credits
SEMESTER I			
1	SM091201	Kalkulus I <i>Calculus I</i>	3
2	SF091201	Fisika Dasar I <i>Basic Physics I</i>	3
3	IG091308	Bahasa Inggris <i>English</i>	2
4	TE091210	Pengantar Teknik Elektro <i>Introduction to Electrical Engineering</i>	2
5	TE091311	Matematika Teknik I <i>Engineering Mathematics I</i>	3
6	TE091313	Dasar Sistem Telekomunikasi <i>Introduction to Telecommunication System</i>	2
7	TE091314	Algoritma, Pemrograman dan Lab. Komputer <i>Algorithm, Programming and Computer Lab.</i>	3
Jumlah sks/Total of credits			18
SEMESTER II			
1	SM091202	Kalkulus II <i>Calculus II</i>	3
2	TE091320	Matematika Teknik II <i>Engineering Mathematics II</i>	4
3	TE091321	Pengukuran Besaran Listrik <i>Electrical Measurement</i>	2
4	TE091322	Rangkaian Listrik <i>Electrical Circuit</i>	4
5	TE091324	Rangkaian Digital <i>Digital Circuit</i>	3
6	TE091325	Lab. Dasar Sistem Telekomunikasi dan Rangkaian Digital <i>Basic Telecommunication System and Digital Circuit Lab.</i>	2
Jumlah sks/Total of credits			18
SEMESTER III			
1	TE091330	Probabilitas dan Statistik <i>Probability and Statistics</i>	2
2	TE091331	Medan Elektromagnetik <i>Electromagnetic Field</i>	4
3	TE091332	Komunikasi Data <i>Data Communications</i>	2
4	TE091333	Rangkaian Elektronika <i>Electronics Circuit</i>	4
5	TE091334	Sistem Linier <i>Linear System</i>	3
6	TE091335	Organisasi dan Arsitektur Komputer <i>Computer Organization and Architectures</i>	3
7	TE091336	Lab. Pengukuran Listrik dan Rangkaian Listrik <i>Electrical Measurement and Circuit Lab.</i>	2
Jumlah sks/Total of credits			20

SEMESTER IV			
1	TE091340	Konversi Tenaga Listrik <i>Electric Power Conversion</i>	3
2	TE091342	Pengolahan Sinyal Digital <i>Digital Signal Processing</i>	3
3	TE091344	Rangkaian Elektronika Analog <i>Analog Electronics Circuit</i>	3
4	TE091345	Proses Stokastik <i>Stochastic Process</i>	3
5	TE091346	Dasar Sistem Pengaturan <i>Introduction to Control System</i>	3
6	TE091348	Metode Numerik dan Komputasi <i>Numerical Methods and Computing</i>	3
7	TE091349	Lab. Elektronika, Sinyal dan Komunikasi Data <i>Electronics, Signal and Data Communication Lab.</i>	2
Jumlah sks/ <i>Total of credits</i>			20
SEMESTER V			
1	IG091306	Pendidikan Kewarganegaraan <i>Civic Education</i>	2
2	TE091350	Lab. Sistem Pengaturan dan Konversi Tenaga Listrik <i>Control System and Electric Power Conversion Lab.</i>	2
Mata Kuliah Bidang Studi			16
Jumlah sks/ <i>Total of credits</i>			20
SEMESTER VI			
1	IG091309	Pengantar Ilmu Lingkungan <i>Environmental Science</i>	2
2	TE091397	Kerja Praktek <i>Job Training</i>	2
Mata Kuliah Bidang Studi			16
Jumlah sks/ <i>Total of credits</i>			20
SEMESTER VII			
1	IG091307	Bahasa Indonesia <i>Bahasa Indonesia</i>	2
2	TE091398	Pra Tugas Akhir <i>Project Proposal</i>	2
Mata Kuliah Bidang Studi			16
Jumlah sks/ <i>Total of credits</i>			20
SEMESTER VIII			
1	IG091311	Pengantar Technopreneurship <i>Introduction to Technopreneurship</i>	2
2	TE091399	Tugas Akhir <i>Final Project</i>	4
3	IG09130x	Pendidikan Agama <i>Religious Education</i> (x: 1=Islam, 2=Kristen, 3=Katolik, 4=Hindu, 5=Budha)	2
Jumlah sks/ <i>Total of credits</i>			8

SILABUS KURIKULUM/*COURSE SYLLABUS*

MATA KULIAH/ COURSE TITLE	TE091401: Analisis Sistem Tenaga TE091401: <i>Power System Analysis</i> Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari dan Memahami analisis aliran daya dan penerapannya untuk menganalisis sistem tenaga listrik Mempelajari dan memahami analisis hubung singkat dan analisis stabilitas serta penerapannya untuk menganalisis sistem tenaga listrik. <i>To understand load flow analysis and its application for power system analysis.</i> <i>To understand short circuit analysis and its application for power system analysis.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami dan mampu menerapkan aliran daya dalam menganalisis sistem tenaga listrik. • Mahasiswa memahami kondisi peralihan sistem tenaga listrik, mampu menghitung arus hubung singkat, menentukan spesifikasi CB, mampu menganalisis ketabilan generator jika terjadi gejala peralihan. • <i>Student should understand load flow analysis and be able to apply load flow analysis for power system analyzing.</i> • <i>Student should understand power system transient and be able to calculate short circuit current, determine CB specification, and analyze generator stability under transient condition.</i>
POKOK BAHASAN/ SUBJECTS	• Pengertian mengenai daya listrik, aliran daya dan sistem 3 fasa untuk keadaan steady-state dan seimbang/simetri; Pemodelan komponen-komponen utama sistem tenaga listrik: Generator, saluran transmisi, transformator, dan beban; Pemodelan rangkaian sistem tenaga listrik: diagram segaris, diagram impedansi dan admitansi, perhitungan dengan sistem per unit. Pembentukan matrix admitansi (Y_{bus}) dan matrix impedansi (Z_{bus}). Analisis aliran daya: metode Gauss Seidel, Newton Raphson, Fast Decoupled. Pengaturan daya dan tegangan dalam sistem tenaga listrik. • Sistem tenaga listrik dalam keadaan hubung singkat simetri dan tak simetri; jenis, tujuan, asumsi dalam analisis hubung singkat; peralihan selama hubung singkat; tegangan internal mesin berbeban dalam keadaan peralihan; analisis hubung singkat tiga fasa simetri (metode Z_{bus}), MVA hubung singkat, pemilihan

	pemutus; komponen simetri, impedansi urutan dan rangkaian urutan, hubungan rangkaian urutan; analisis hubung singkat dengan komponen simetri: hubung singkat tiga fasa, satu fasa ke tanah, antar fasa dan dua fasa ke tanah; stabilitas dalam sistem tenaga listrik; diagram fasor dan kurva P-δ generator serempak; stabilitas steady-state, stabilitas transient: persamaan ayunan rotor, kriteria luas sama dan penerapannya pada analisis stabilitas. • <i>Electrical power, load flow, 3-phase system under steady-state and balanced/symmetrical; Modeling of power system main components: generator, transmission lines, transformer, and load; Modeling of power system: single line diagram, admittance and impedance diagram, per unit system; Admittance matrix (Ybus) and impedance matrix (Zbus); Load flow analysis: Gauss Seidel method, Newton Raphson, Fast Decoupled; Power and voltage regulation in power system.</i> • <i>Electrical power system under symmetrical short circuit and asymmetrical; Types of, purpose, and assumption for short circuit analysis; transient during short circuit; loaded machine internal voltage during transient; 3-phase symmetrical short circuit analysis (Zbus method); short circuit capability; circuit breaker selection; symmetrical component, sequence impedance and sequence circuit; short circuit analysis using symmetrical component: three-phase short circuit, phase-to-ground short circuit, phase-to-phase short circuit, phase-phase-to-ground short circuit; power system stability; steady-state stability, transient stability: rotor swing equation, equal area criterion and its application for stability analysis.</i>
PUSTAKA UTAMA/ REFERENCES	• John J. Grainger, William D. Stevenson, Jr., Power System Analysis, McGraw-Hill Inc, 1994 • Hadi Saadat, Power System Analysis, McGraw-Hill Inc, 1999 • M.E. El-Hawary, Electric Power Systems : Design and Analysis, Reston Publishing Company, 1983. • C.A. Gross, Power System Analysis, 2nd Edition, John Wiley & Sons, 1983 • Turan Gonen, Modern Power System Analysis, John Wiley & Sons, 1988 • J. Arrillaga, N.R. Watson, Computer Modelling of Electrical Power Systems, Second Edition, John Wiley and Sons Ltd., 2001.

MATA KULIAH/ COURSE TITLE	TE091403: Mesin Arus Bolak-balik TE091403: <i>Alternating Current Machines</i> Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari dan Memahami konsep dasar Mesin Arus Bolak-Balik. Mempelajari dan memahami analisis Mesin Arus Bolak-Balik beserta karakteristiknya. <i>To understand deeply of the basic of AC machine.</i> <i>To understand analysis and characteristics of AC machine.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami konsep Mesin Arus Bolak-Balik. • Mahasiswa memahami, menghitung dan menganalisis Mesin Arus Bolak-Balik dalam keadaan steady-state. • <i>Student should understand AC machine concept.</i> • <i>Student should be able to make calculation regarding AC machine parameters and analyze AC machine under steady-state condition.</i>
POKOK BAHASAN/ SUBJECTS	• Teori Umum Mesin Elektrik: Memahami konsep dasar magnet dan hubungannya dengan elektrik; memahami konsep dasar mesin elektrik, memahami peranan magnet dalam mesin elektrik, dasar-dasar analisis, tanda-tanda dari variabel mesin elektrik; memahami dan menghitung penguatan medan dan macam-macamnya, memahami dan menghitung tegangan induksi; memahami dan menghitung penguatan jangkar dan timbulnya torka dan perhitungannya, memahami unified theorem dan penggunaannya pada mesin arus bolak-balik. • Transformator: Macam trafo dalam sistem keelektrikan, Trafo ideal, Trafo tidak ideal, Trafo multi-fasa, Rangkaian Ekuivalen, Testing trafo, Regulasi Tegangan, Daya dan efisiensi, Kerja paralel, Autotrafo, Tap-changers, Induksi Regulator. • Motor Induksi Tiga-Fasa: Fitur mesin induksi tiga-fasa, Sistem kemagnitan dalam m.i. tiga-fasa, medan putar, tegangan induksi pada kumparan stator dan rotor, rangkaian ekuivalen, penentuan parameter, aliran daya dalam m.i., pembentukan torka, dinamika sistem, m.i. tipe sangkar, pengaturan arus dan torka mula dalam motor sangkar, torka parasit. • Motor Sinkron: Fitur mesin sinkron, pembentukan tegangan induksi dalam m.s , diagram fasor untuk kutub silndris, diagram fasor untuk kutub menonjol, modeling m.s., penentuan parameter m.s. pemisahan reaktansi bocor dan reaktansi jangkar, pembentukan torka dalam m.s., aliran daya dalam m.s., kerja m.s.

	sebagai generator, motor dan condensor, karakteristik m.s. • <i>Basic theory of electrical machine.</i> • <i>Transformer: types of transformer, ideal transformer, non-ideal transformer, multi-phase transformer, equivalent circuit, transformer testing, voltage regulator, power and efficiency, parallel operation, autotransformer, tap-changers, regulator induction.</i> • <i>Three-phase induction motor: Three-phase induction motor features, induction motor magnetic system, rotating field, induced voltage in stator and rotor, equivalent circuit, parameters determination, induction motor load flow, torque generation, system, squirrel-cage induction motor, starting current and torque regulation, stray torque.</i> • <i>Synchronous motor: synchronous motor features, induced voltage generation in a synchronous motor, cylindrical pole phasor diagram, salient pole phasor diagram, synchronous motor modeling, synchronous motor parameters determination, leakage reactance and armature reactance separation, torque generation, synchronous motor load flow, synchronous motor as generator, motor and condenser, synchronous motor characteristics.</i>
PUSTAKA UTAMA/ REFERENCES	• Soebagio, Teori Umum Mesin Elektrik, Penerbit Srikandi, 2008 • Soebagio, Transformator, Rencana diterbitkan th. 2009. • Soebagio, Mesin Induksi Tiga-Fasa, Diktat kuliah Jurusan Teknik Elektro ITS, 2006. • Soebagio, Mesin Sinkron, Diktat kuliah Jurusan Teknik Elektro ITS, 2006. • S.K. Sen, Electrical Machinery, Khanna Publishers, New Delhi, 1993.. • B.S. Guru & H.R. Hiziröglu, Electric Machinery and Transformers, Harcourt Brace Javanovich, Publishers, Technology Publications, San Diego, New York, Chicago, Austin, Washington DC, London, Tokyo, Toronto, 1988. • J. Chapman, Electric Machinery Fundamentals, McGraw-Hill, Inc., New York, St. Louis, San Fransisco, Auckland, Bogotá, Caracas, Hamburg, Lisbon, London, Madrid, Mexico, Milan, Montreal, New Delhi, Paris, San Juan, São Paolo, Singapore, Sydney, Tokyo, Toronto, 1991.

MATA KULIAH/ COURSE TITLE	TE091405: Komputasi Cerdas TE091405: <i>Soft Computing</i> Credits: 2 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Student can be able to understand the concept & structure of the biological inspired computation Student can describe and examines the principle of the biological inspired computation
KOMPETENSI/ COMPETENCY	• Student can develop & implement the simple software of the biological inspired computation to the field of electric power through a simple simulation
POKOK BAHASAN/ SUBJECTS	• Foundation of Artificial Neural Networks: basic concepts of neural networks, single-layer and multilayer perceptrons, self-organizing maps and training algorithm: supervised & unsupervised. • Fundamental of Fuzzy Logic: Topics covered include fuzzy set theory, fuzzy systems, membership function, rule base and inference engine development • Introduction to Evolutionary Algorithm: genetic algorithm, genetic programming, ant colony method, particle swarm optimization, artificial immune system. • Hybrid Algorithm: neuro-fuzzy, neuro-ga, fuzzy-ga, immune-evolutionary, etc . • Simple Project
PUSTAKA UTAMA/ REFERENCES	• Jang JSR., Neuro Fuzzy & Soft Computing, Prentice Hall, 1997 • Purnomo, MH, Supervised Learning Neural Networks, Graha Ilmu. 2006. • Purnomo, MH, Diktat Algoritma Cerdas, PENS-ITS. 2002. • Matlab toolbox (NN, Fuzzy logic, GA)

MATA KULIAH/ COURSE TITLE	TE091410: Elektronika Daya TE091410: <i>Power Electronics</i> Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa dapat memahami dan menganalisis karakteristik komponen-komponen utama pada sistem yang berbasis elektronika daya Mahasiswa dapat memahami karakteristik, menganalisis, menyelesaikan problem sederhana dan mengembangkan peralatan pengkonversian energi Mahasiswa memahami sistem peralatan berbasis elektronika daya untuk berbagai aplikasi misalnya untuk perbaikan kualitas daya, pembangkitan, transmisi dan distribusi <i>To analyze characteristics of main components in a power electronics-based system.</i> <i>To analyze the characteristics of energy conversion devices.</i> <i>To solve simple problems about and make simple improvement of energy conversion devices.</i> <i>To understand the system of power electronics-based devices regarding several applications such as power quality improvement, power generation, transmission, and distribution.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menjelaskan prinsip kerja dan karakteristik peralatan saklar semikonduktor, serta sistem dengan basis saklar semikonduktor • Mahasiswa dapat mengidentifikasi, menganalisis dan menyelesaikan problema yang berkaitan dengan peralatan pengkonversi energi • Mahasiswa dapat menguasai konsep dasar dan mengembangkan suatu sistem berbasis elektronika daya yang berlandaskan kaidah atau standard terkait • Mahasiswa mampu menjelaskan ide dalam bentuk penulisan dan lisan <i>• Student should understand basic principles and characteristics of solid-state devices and solid-state system.</i> <i>• Student should identify, analyze, and solve simple problems about energy conversion devices.</i> <i>• Student should master basic concepts and be able to develop an electronics-based system based on related standards.</i> <i>• Student should be able to express ideas in written and oral forms.</i>

POKOK BAHASAN/ SUBJECTS	• Konsep dasar dan saklar semikonduktor: lingkup, aplikasi dan konsep dasar elektronika daya; Contoh peralatan uninterruptible power supply (UPS); Parameter utama pada saklar mekanis, elektro-mekanis dan semikonduktor; Prinsip kerja dan karakteristik diode, thyristor dan transistor. • Karakteristik Sistem DC: karakteristik steady state dan transient arus, tegangan, daya pada sumber DC yang dirangkai dengan saklar semikonduktor dan variasi beban listrik: resistif, resistif-induktif, resistif-kapasitif, dan kombinasi lainnya. • Konverter DC-to-DC: prinsip dasar dan karakteristik konverter buck, boost, dan buck-boost. • Karakteristik Sistem AC: karakteristik steady state dan transient tegangan, arus, daya pada sumber AC yang dirangkai dengan saklar semikonduktor dan variasi beban listrik: resistif, resistif-induktif, resistif-kapasitif, dan kombinasi lainnya • Konverter AC meliputi AC ke DC, AC ke AC dan DC ke AC. Dipelajari pula aplikasi sistem terintegrasi termasuk Uninterruptible Power Supply, VSD, FACTS dan sebagainya. • <i>Basic concepts and semiconductor switches: field, application, and basic concepts of power electronics; examples of uninterruptible power supply (UPS); main parameters of mechanical, electro-mechanical, and semiconductor switch; Principles and characteristics of diode, thyristor, and transistor.</i> • <i>DC system characteristics: steady-state and transient characteristics of current, voltage, and power of a DC source connected to a semiconductor switch and varied load: resistive, resistive-inductive, resistive-capacitive, and other combinations.</i> • <i>DC-DC-converter: basic principles and characteristics of buck, boost, and buck-boost.</i> • <i>AC system characteristics: steady-state and transient characteristics of current, voltage, and power of a DC source connected to a semiconductor switch and varied load: resistive, resistive-inductive, resistive-capacitive, and other combinations.</i> • <i>AC converters including AC- DC, AC- AC and DC- AC. Applications of integrated systems based on Power Electronics , such as: Uninterruptible Power Supply, VSD, FACTS, etc are also discussed.</i>
PUSTAKA UTAMA/ REFERENCES	• MH. Rashid. "Power Electronics", John Wiley and Son publishing Company, 2003 • Ned Mohan Underland. "Power Electronics",

MATA KULIAH/ COURSE TITLE	TE091411: Teknik Tegangan Tinggi TE091411: High Voltage Engineering Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memiliki pengetahuan fenomena tegangan tinggi baik proses pembangkitan tegangan tinggi juga proses kegagalan pada bahan isolasi tegangan tinggi termasuk fenomena petir dan partial discharge <i>Students have knowledge about high voltage phenomena such as high voltage generation as well as breakdown process on high voltage insulation, lightning phenomena and partial discharge</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan cara-cara pembangkitan tegangan tinggi ac, dc dan impuls. • Mahasiswa mampu menjelaskan proses kegagalan pada bahan isolasi tegangan tinggi gas, padat dan cair. • <i>Students able to explain the generation of AC high voltage, DC high voltage and Impulse high voltage</i> • <i>Students able to explain breakdown process on insulation material such as AC, DC, Impulse</i>
POKOK BAHASAN/ SUBJECTS	• Fenomena penggunaan tegangan tinggi praktis, • Pembangkitan Tegangan Tinggi AC, DC, Impuls untuk pengujian • Kegagalan pada bahan isolasi gas, cair dan padat • Fenomena Petir • Partial Discharge dan pengukurannya • <i>Phenomena of practical usage of high voltage engineering</i> • <i>AC, DC, and Impulse High Voltages Generation for Testing</i> • <i>Breakdown at gas, liquid, and solid insulation</i> • <i>Lightning phenomena</i> • <i>Partial discharge and its measurement</i>
PUSTAKA UTAMA/ REFERENCES	• Some papers about corona from IEEE Journal • Haddad A., Warne D.(Editors), Advanced in High Voltage Engineering, The Institution of Electrical Engineering, London, 2004

MATA KULIAH/ COURSE TITLE	TE091409: Transmisi dan Distribusi TE091409: <i>Transmission and Distribution System</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa dapat memahami desain sistem distribusi dan transmisi tenaga listrik. Mahasiswa dapat memahami dan menganalisis permasalahan pada sistem distribusi dan transmisi tenaga listrik yang meliputi operasi, stabilitas tegangan, dan rugi – rugi pada sistem tenaga listrik
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menjelaskan faktor – faktor yang mejadi pertimbangan dalam perencanaan sistem transmisi dan distribusi • Mahasiswa dapat menganalisa pengaturan/operasi sistem distribusi dan transmisi tenaga listrik untuk mendapatkan sistem yang handal. • Mahasiswa dapat mengidentifikasi dan menganalisis permasalahan pada sistem transmisi dan distribusi yang berhubungan dengan desain dan operasi sistem.
POKOK BAHASAN/ SUBJECTS	• Konsep dasar Sistem Transmisi dan Distribusi : Pengenalan secara umum penggunaan sistem transmisi dan distribusi yang meliputi fungsi sistem, dan permasalahan umum yang dihadapi terutama di Indonesia. • Desain Sistem Transmisi dan Distribusi : Membahas prinsip perencanaan sistem Transmisi dan Distribusi yang meliputi sistem tegangan, rating peralatan yang digunakan dan konfigurasi sistem. • Pengoperasian Sistem Transmisi dan Distribusi : Membahas prinsip – prinsip pengoperasian sistem transmisi dan distribusi yang meliputi pengaturan tegangan, otomasi sistem, rugi jaringan dan evaluasi unjuk kerja sistem. • Karakteristik Sistem Trasmisi dan Distribusi : Membahas tentang karakteristik saluran transmisi dan distribusi berkaitan dengan impedansi sistem.
PUSTAKA UTAMA/ REFERENCES	• W.D. Stevenson, Power System Analysis, John Wiley, New York, 1982 • Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill • Turan Gonen, Electric Power Transmission System Engineering: Analysis and Design, John Wiley, 1988. • Gupta, Transmission and Distribution, 1997 • TS Hutaeruk, Tranmisi Daya <i>Listrik</i>, 2000 • Pabla, AS, Sistem Distribusi Daya Listrik, Penerbit Erlangga

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- Luces M. Faulkenberry, Electrical Distribution and Transmission, Prentice Hall ,1996
 - G.O. Colabuse, Symetrical Components
 - Torsten Cegrell, Power System Control Technology, Prentice Hall International
 - __, Electrical Transmision & Distribution Reference Book, CSE WestingHouse EC.
 - Gunter G. Seip, Electrical Installation Hanbook, John Wiley
 - Theraja, BL, Electrical Technology, Nirja Construction & Development
 - J.J. Granger, W.D. Stevenson, Power System Analysis, John Wiley, New York, 1994
 - P.Kundur, Power System Stability, McGraw Hill, 1994
 - M.El Howary, Power System Analysis and Design, 1982
 - Hutaurok, Gelombang Berjalan
 - B.L. Theraja, A Text Book of Electrical Technology, Nirja Construction and Development, 1980
 - E.W. Kimbark, Direct Current Transmission, Willey Interscience, New York, 1971
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MATA KULIAH/ COURSE TITLE	TE091412: Pengaman Sistem Tenaga Listrik TE091412: <i>Power System Protection</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari dan memahami berbagai jenis rele pengaman dan sistem pengetanahan serta koordinasinya pada sistem tenaga listrik Mempelajari petir dan sifat-sifatnya, pengaruhnya terhadap sistem tenaga listrik, peralatan elektrik serta pengetahuan sistem perlindungan yang dibutuhkan terhadap sambaran petir.
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan prinsip dasar operasi sistem proteksi, komponen sistem pengaman dan cara penentuan setting relay pengaman serta dapat menjelaskan dan menganalisis kordinasi proteksi • Mahasiswa mampu menjelaskan proses terjadinya petir, mengetahui kerusakan yang diakibatkan sambaran petir dan mengetahui macam-macam metode proteksi petir serta mampu merencanakan proteksi petir dan mengkoordinasi isolasinya dalam sistem tenaga listrik.
POKOK BAHASAN/ SUBJECTS	• Gangguan-gangguan sistem tenaga listrik, persyaratan rele pengaman, peralatan transformator, fungsi dan elemen sistem pengaman, macam-macam rele pengaman dan sistem pengamanannya; perhitungan setting rele pengaman serta koordinasinya dalam sistem tenaga listrik; macam-macam sistem pengetanahan serta koordinasinya dengan sistem pengaman. • Pembentukan petir dan parameter petir; Kerusakan dan gangguan karena petir baik langsung atau tidak langsung (galvanic, induktive, capacitive); gelombang berjalan, EMC (Electromagnetic Compability); Proteksi eksternal gedung, Metoda sistem proteksi kerucut, sangkar farady, bola gelinding;Proteksi internal peralatan yang ada di gedung. Untuk sarana electrical, komputer, telekomunikasi, instrumentasi dan instalasi; pengaruh dan proteksi petir pada sistem tenaga listrik, dan koordinasi isolasi dalam sistem tenaga listrik.
PUSTAKA UTAMA/ REFERENCES	• M. Titarenko & I.Noskov, Protective Relaying in Electric Power System, • Sunil S. Rao, Switchgear and Protection, • Turan Gonen, Modern Power System Analysis, • GEC Alsthom, Protective Relays Application Guide, • T.S. Hutaaruk, Pengetanahan Netral Sistem Tenaga dan Pengetanahan Peralatan, • R. Wilhelm and M. Waters, Neutral Grounding in High Voltage

Transmission,

- __, Manual Rele Pengaman,
- Uman, M., Lightning,
- __, Handbuch fur Blitzschutzund Erdung, Hasse,VDE-Verlag, 1993
- T.S. Hutaaruk, Gelombang Berjalan dan Proteksi Surja
- Pritindra Chowdhuri, Electromagnetic Transient in Power System

MATA KULIAH/ COURSE TITLE	TE091415: Desain Sistem Kelistrikan Industri TE091415: <i>Industrial Electrical System Design</i> Credits: 4 Semester: VII
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Merencanakan instalasi gedung dan industri. Mempelajari dan memahami permasalahan kelistrikan di industri. Merencanakan sistem kelistrikan untuk industri, serta mampu menyempurnakan kualitas kelistrikan di industri. <i>To design building and industry installation. To learn about problems in industrial electrical system. To design industrial electrical system and to improve industry power quality.</i>
KOMPETENSI/ COMPETENCY	•
POKOK BAHASAN/ SUBJECTS	• Menggambar instalasi, menghitung kebutuhan peralatan instalasi listrik. Merencanakan sistem distribusi listrik industri, Memodelkan, menyimulasikan dan menganalisa sistem kelistrikan di industri. Pemilihan peralatan yang disesuaikan dengan kebutuhan dan lingkungan industri, design sistem pengaman, sistem pentanahan, perbaikan power quality akibat beban industri dan gangguan luar. • <i>Electrical installation drawing, electrical installation devices calculation; distribution system design; modeling, simulation, and analysis of industrial electrical system. Devices selection; protective system design, grounding system; power quality improvement.</i>
PUSTAKA UTAMA/ REFERENCES	• Ir. E. Setiawan, Instalasi Tenaga Listrik arus Kuat, I, II, III • PUIL 2000 • Toran Gonen, Electric Power Distribution system Engineering, Mc.Graw-Hill. • Irwin Lazar, Electrical System Analysis and Design for Industrial Plants, Mc.Graw-Hill. • T.S. Hutauruk, Pentanahan Netral Sistem Tenaga dan Pentanahan Peralatan, • Wilson E. Kazibwe, Musoke H. Sendaula, Electrical Power Quality Control Techniques, Van Nostrand Reinhold, 1993

MATA KULIAH/ COURSE TITLE	TE091500: Kendali Sistem Tenaga Listrik TE091500: Power System Control Engineering Credits: 3 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberi bekal pada pada mahasiswa untuk dapat melakukan analisis, mendiskripsikan ulang, dan mengungkapkan ide-ide logik secara lisan dan tertulis pada peran sistem kendali pada sistem sistem tenaga listrik. <i>Students able to analyze, describe, and express logic idea in verbal and writing form about importance of control system in electrical power system</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menganalisis peran sistem kontrol pada sistem tenaga listrik. • Mahasiswa dapat mendiskripsikan komponen sistem kontrol dari sistem pembangkit sampai ke beban. • Mahasiswa dapat mengungkapkan argumentasi dan mengembangkan ide desain kontroler yang digunakan pada sistem tenaga listrik. • <i>Students able to analyze the importance of control system in electrical power system</i> • <i>Students able to describe control system components from generation system to load</i> • <i>Students able to express and to develops design controller idea on electrical power system</i>
POKOK BAHASAN/ SUBJECTS	• Introduksi Dalam pokok bahasan ini dibahas secara singkat tentang latar belakang dan permasalahan sistem tenaga, terutama tentang aplikasi rekayasa kontrol dan peralatan kontrol pada sistem tenaga. • Introduction <i>Brief background and problems in power system, especially control engineering and control equipments in power system</i> • Matriks khusus Matriks khusus meliputi penyelesaian matriks yang berhubungan dengan penyelesaian permasalahan rekayasa kontrol. Tipe matriks, operasi penjumlahan, perkalian, transpose, determinan, kofaktor, adjoint, dan proses inversi matriks dibahas secara detail dengan contoh-contoh soal. • Special <i>Special matrix related to control engineering problem solving. Type of matrices, matrix addition, matrix multiplication, transpose</i>

matrix, determinant, cofactor, matrix inverse, include some detail example.

- State space
Persamaan state space meliputi pemodelan state space dari bentuk rangkaian elektronika, pemodelan state space dari persamaan diferensial, persamaan state space dalam bentuk Kanonik Jordan, pembentukan matriks transformasi P, mengubah persamaan state space menjadi persamaan diferensial, dan penyelesaian persamaan state space.
- State space
State space equation included state space model from electric network, state space model from differential equation, state space in form Jordan Canonic, matrix transformation, transformation from state space to differential equation, and state space equation solving
- Kontrolabiliti, observabiliti, dan stabiliti
Dalam pokok bahasan ini dibahas tentang 3 syarat utama yang harus dimiliki oleh sebuah sistem sebelum dilakukan pengaturan yaitu kontrolabiliti, observabiliti, dan stabiliti.
In this chapter will be discussed three main requirement must be had by a system before controlled such as controllability, observable, stability
- Dasar-dasar kestabilan
Dalam pokok bahasan ini dibahas tentang dasar-dasar kestabilan sistem tenaga listrik yang meliputi dasar-dasar persamaan daya, pemodelan SMIB (Single Machine Infinite Bus), ekuilibrium, dan kestabilan kondisi mantap (steady state).
- Principle of Stability
Basic principle of stability system of electrical power system include basic power flow equation, SMIB (Single Machine Infinite Bus) model, equilibrium, and steady state stability.
- Model linear SMIB
Dalam pokok bahasan ini dibahas tentang pemodelan linear dari sistem tenaga listrik SMIB dalam bentuk persamaan matematika yang meliputi persamaan tegangan, persamaan torque elekrika, dan persamaan mesin sinkron.
- Linear model of SIMB
Linear model of SIMB power system in form mathematical such as voltage equation, electric torque equation, and equation of synchronous machine
- Konstanta K1 sampai K6
Dalam pokok bahasan ini dibahas tentang cara untuk menghitung konstanta K1 sampai dengan K6 melalui penguasaan phasor sistem SMIB.
- K1 to K6 constants

Determining of K1 to K6 constants based on SIMB phasor system

- Contoh soal
Pemberian contoh-contoh soal untuk sistem SMIB meliputi persyaratan Kontrolabiliti, Observabiliti, dan Stabiliti.
 - *Example*
Give some example of SMIB system included controllability, observability, and stability requirements
 - Sistem kontrol eksitasi
Dalam pokok bahasan ini dibahas tentang jenis-jenis eksitasi, pemodelan eksitasi dalam diagram blok dan dalam pemodelan linear, dan kontribusi pemodelan eksitasi ke dalam sistem SMIB
 - *Excitation control system*
In this chapter will be discussed types of excitation, excitation model in block diagram and linear model, and excitation model contribution on SMIB system
 - Power System Stabilizer
Pokok bahasan ini menjelaskan materi PSS (Power System Stabilizer) yang bekerja sama dengan sistem eksitasi untuk menjaga kestabilan sistem tenaga listrik dan pemodelan PSS.
In this chapter will be discussed PSS (Power System Stabilizer) and which operates together with excitation system to maintain system stability as well as PSS modeling.
 - Load Frequency Control
Pada pokok bahasan ini dibahas tentang pengaturan frekuensi yang meliputi pengaturan daya aktif, perilaku governor, dan Automatic Generation Control (AGC) pada sistem tenaga listrik. Pemodelan pengaturan frekuensi sistem tenaga dilakukan dengan pendekatan model linear.
In this chapter will be discussed frequency control including: active power control, governor performance, and AGC (Automatic Generation Control) in power system. Power system frequency control modeling is done with a linear model approach.
 - Kontrol Daya Reaktif
Pada pokok bahasan ini dibahas tentang pengaturan daya reaktif. Produksi daya reaktif yang tidak diinginkan oleh sistem dikendalikan untuk mencapai nilai minimal melalui pengaturan parameter dan variabel sistem.
In this chapter will be discussed reactive power control. Unwanted reactive power will be controlled to reach a minimal value through system parameter and system variable.
 - Osilasi Torsional
Pada pokok bahasan ini dibahas mengenai karakteristik dan pemodelan dari suatu sistem poros generator turbin dan beragam permasalahan yang terkait dengan osilasi torsional.
In this chapter will be discussed characteristics and modeling of a generator turbine shaft and various problems related to torque
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	<i>oscillation.</i> • Multimesin Pada pokok bahasan ini dibahas tentang pengenalan sistem multimesin dengan berbagai variabel dan parameter yang terbentuk dalam rangkaian linear. <i>In this chapter will be discussed introduction of multimachine system in various variables and parameters formed in linear circuit.</i>
PUSTAKA UTAMA/ REFERENCES	• Imam Robandi, Modern Power System Control: Design and Solution, 2008 • P.M. Anderson & A.A. Fouad, Power System Control and Stability, The Iowa State University Press, 1977. • Pustaka Penunjang • Prabha Kundur, Power System Stability and Control, McGraw-Hill, Inc., 1994 • M.A. Pai, Power System Stability, North-Holland Publishing Company, 1981. • K.R. Padiyar, Power System Dynamics, John Wiley & Sons Ltd, Interlaine Publishing Ltd. 1996. • Marija Ilic, et.al., Dynamics and Control of Large Electric Power Systems, John Wiley & Sons, Inc., 2000. • Agelidis et.al, Electronic Control in Electrical Power Systems (Power Engineering Series), IEEE, 2002

MATA KULIAH/ COURSE TITLE	TE091502: Tek. Komunikasi pada Sistem Tenaga TE091502: <i>Communication Tech. in Power System</i> Credits: 2 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari dan memahami sistem komunikasi dalam sistem tenaga listrik
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami konsep kerja sistem komunikasi dalam sistem tenaga listrik • Mahasiswa memahami manfaat sistem komunikasi dalam sistem tenaga listrik
POKOK BAHASAN/ SUBJECTS	• Sistem tenaga listrik dan pusat pengendalian; fungsi-fungsi dasar sistem pengendalian tenaga listrik; konsep dasar pengembangan sistem pengendalian; spesifikasi sistem pengendalian; kinerja dan keandalan sistem pengendalian; perangkat-perangkat substation; sistem komunikasi data; pengembangan sistem pengendalian; pengembangan sistem kelistrikan masa depan
PUSTAKA UTAMA/ REFERENCES	• Torsten Cegrell, Power System Control Technology, Prentice Hall, 1986 • Mohammad Shahidehpour et.al, Communication and Control in Electric Power System, John Willey and Son, 2003 • Bonar Panjaitan, Teknologi Sistem Pengendalian Tenaga Listrik Berbasis SCADA, Prenhallindo, Jakarta

MATA KULIAH/ COURSE TITLE	TE091503: Kecerdasan Tiruan pada Sistem Tenaga TE091503: <i>Artificial Intelligence in Power System</i> Credits: 2 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberi bekal pada mahasiswa untuk dapat melakukan analisis, mendiskripsikan ulang, dan mengungkapkan ide-ide logis secara lisan dan tertulis pada aplikasi AI pada sistem tenaga listrik.
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menganalisis peran Artificial Intelligence(AI) pada penyelesaian permasalahan sistem tenaga listrik. • Mahasiswa dapat mendiskripsikan parameter dan variabel AI pada penyelesaian permasalahan sistem tenaga listrik. • Mahasiswa dapat mengungkapkan argumentasi dan mengembangkan ide desain Artificial Intelligence(AI) pada penyelesaian permasalahan sistem tenaga listrik.
POKOK BAHASAN/ SUBJECTS	• Konsep dasar Artificial Intelligence (AI) yang terdiri dari Fuzzy Logic Control (FLC), Genetic Algorithm, Neural Network, Artificial Immune System, Support Machine System, Ant Colony, dan Bee Colony. • Objek atur pada sistem tenaga listrik • AI untuk mengatur Governor dan Sistem Eksitasi • AI untuk mengatur Power System Stabilizer • AI untuk mengatur parameter UPFC • AI untuk mengatur parameter TCSC • AI untuk mengatur parameter STATCOM dan SVC • AI untuk mengatur energy pada Sistem Photovoltaic dan Wind Power • AI untuk mengatur Estimasi Pembangkitan • AI untuk pengaturan energi pada Mobil Listrik • AI untuk melakukan perhitungan Load Flow dan Early Warning System • AI untuk melakukan Sistem Proteksi Tenaga Listrik • AI untuk mendesain Kelistrikan Industri • AI untuk mengatur Daya Aktif, daya Reaktif, dan Power Quality
PUSTAKA UTAMA/ REFERENCES	• Imam Robandi, Desain Sistem Tenaga Modern: Fuzzy Logic, Optimization, Genetic Algorithm, ANDI Publisher, 2006. • Mohamed E.El-Hawari, Electric Power Applications of Fuzzy Systems, IEEE Press, 1998. • Imam Robandi, Artificial Intelligence Applications, 2008

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- Junhong Nie, et.al., Fuzzy-Neural Control, Principles, Algorithms and Applications, Prentice Hall, 1995.
 - Mohammad Jamshidi, Fuzzy Logic and Control, Software and Hardware Applications, Vol.2, Prentice Hall, 1993.
 - James Larminie and John Lowry, Electric Vehicle Technology Explained, Wiley & Sons, Ltd., 2003.
 - Deo Prasad & Mark Snow, Designing with Solar Power – a Sourcebook for Building Integrated Photovoltaics – New edition, Eartscan, May 2005.
 - Mukund R Patel, Wind and Solar Power System: Design, Analysis, and Operation Second Edition, CRC Press, 2005
 - CE Brown, World Energy Resources, Springer, 2002.
 - The German Solar Energy Society, Planning and Installing Photovoltaic System – Guide for Installers, Architects and Engineer, James and James, 2004.
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MATA KULIAH/ COURSE TITLE	TE091504: Penggunaan Motor Listrik TE091504: <i>Electric Motor Application</i> Credits: 2 Semester:
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa akan dapat memahami jenis-jenis motor listrik dan menentukan jenis motor listrik yang sesuai dengan jenis beban secara optimal. <i>Students should understand types of electrical motor and to optimally determine kind of suitable electrical motor for given load</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat mengerti macam-macam karakteristik dari beban. • Mahasiswa dapat menentukan/memilih motor listrik berdasarkan karakteristik motor dan beban yang sesuai. • Mahasiswa dapat menentukan/memilih cara starting dan pengereman yang sesuai dengan kebutuhan beban. • Mahasiswa dapat menjelaskan cara pengaturan kecepatan motor listrik secara konvensional maupun elektronik sesuai kebutuhan beban. • <i>Students should understand types of load characteristics</i> • <i>Student should be able to determine or to select electrical motor based on motor and load characteristics</i> • <i>Student should be able to determine or to select electrical motor starting and breaking based on given load</i> • <i>Student should be able to explain how to control motor speed conventionally and electronically for a given load.</i>
POKOK BAHASAN/ SUBJECTS	• Perkembangan penggunaan motor listrik; sejarah perkembangannya. Pengertian Torsi Beban; Karakteristik Kecepatan – Torsi dari suatu penggerak peralatan industri, persamaan gerak, menentukan Torsi dan daya yang dibutuhkan oleh beban serta momen inertiannya, karakteristik beban untuk beberapa tipe drive. Lingkungan motor; Hal-hal yang mempengaruhi dan dipengaruhi motor listrik. Spesifikasi motor; rating, kenaikan temperatur, kelas isolasi, macam-macam siklus kerja motor, kenaikan temperatur, kurva pemanasan dan pendinginan. Rating motor untuk kerja kontinyu; beban konstan, beban variable dan waktu singkat. Karakteristik Listrik motor; motor arus searah, motor arus bolak balik, motor arus bolak balik satu fasa dan tipe pelindung (enclosure) motor. Starting motor; motor arus searah, motor arus bolak balik. Pengereman motor; motor arus searah, motor arus bolak balik. Pengaturan kecepatan motor; motor arus searah, dinamika starting motor induksi, load

	equalization, motor induksi rotor sangkar dan rotor gelung secara konvensional dan elektronik. • <i>Usage development of Electrical motor: Its development history. Torque definition: Torque-Speed characteristics of industrial prime mover, motion equation, Determining of torque and power required by load and its moment inertia, load characteristics for various type of drive, Motor environment: Parameters affect and be affected by electrical motor. Motor specification; rating, temperature rise, insulation class, work type cycle of motor, heat curve, cooling. Motor rating of continuous operation, constant load, variable load, and temporary time. Electrical motor characteristics; DC motor, AC Motor, single phase motor, enclosure types. Motor starting: DC motor, AC motor. Motor breaking: DC motor, AC motor. Motor speed control: DC motor, Dynamic starting of induction motor, load equalization, Squirrel Cage induction motor, wound rotor conventionally and electronically</i>
PUSTAKA UTAMA/ REFERENCES	• M.V.Deshpande, "Electric Motor Application and Control", A.H Wheeler and Co.Ltd., 1990. • M H. Rashid, "Power Electronics Circuits, Devices and Applications, Prentice – Hall International Editions. ISBN : 0-13-686619-0 • Prof.T M Sulaiman, "Mesin Tak Serempak dalam Praktek.

MATA KULIAH/ COURSE TITLE	TE091506: Desain Sis.Kelistrikan dgn S.Energi T. TE091506: <i>Renewable Energy Electrical Sys. Design</i> Credits: 2 Semester:
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa dapat memahami dan menganalisis karakteristik sumber energi terbarukan, terutama photovoltaic, tenaga angin, tenaga air. Mahasiswa dapat memahami karakteristik, menganalisis, mengembangkan sistem pembangkit listrik dengan sumber energi terbarukan: stand-alone, hybrid Mahasiswa dapat memahami konsep dasar dan melakukan analisis ekonomi pada sistem kelistrikan dengan sumber energi terbarukan <i>Students understand and have knowledge to analyze characteristic of renewable energy resources especially photovoltaic system, wind energy, and hydro energy.</i> <i>Students understand the characteristic, have analysis capability, and can develop power system generation with renewable energy resources: stand alone and hybrid systems</i> <i>Students understand the basic concept and have knowledge about economic analysis of electrical power system using renewable energy resources</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menjelaskan prinsip kerja dan karakteristik sumber energi terbarukan, terutama photovoltaic, tenaga angin, tenaga air • Mahasiswa dapat mengidentifikasi, menganalisis dan mendesain pembangkit listrik dengan sumber energi terbarukan: stand-alone, hybrid • Mahasiswa dapat menguasai konsep dasar dan mengembangkan suatu sistem kelistrikan dengan sumber energi terbarukan beserta analisis ekonomi • Mahasiswa mampu menjelaskan ide dalam bentuk penulisan dan lisan • <i>Students should be able to explain principle and characteristics of renewable energy resources especially photovoltaic, wind energy and hydro energy</i> • <i>Students should be able to identify, analyze, and design power system generation with renewable eneergy resources: stand alone and hybrid systems</i> • <i>Students understand the basic concept and should be abble to develop electrical power system with renewable energy resources and its economic analysis</i> • <i>Students should be able to explain ideas in oral and writing skills.</i>

**POKOK
BAHASAN/
SUBJECTS**

- Konsep dasar energi dan lingkungan: review dan proyeksi kebutuhan- pemenuhan energi dunia, nasional; Pemakaian dan potensi sumber energi fosil dan terbarukan; Global warming dan efek terhadap lingkungan; Energy policy dunia; Pengelolaan Energi Nasional
- Karakteristik energi surya dan photovoltaic: review cahaya matahari sebagai sumber energi, kerapatan energi, insolasi relatif terhadap pergerakan matahari, karakteristik sel photovoltaic, daya maksimum
- Karakteristik tenaga angin dan turbin angin : review energi kinetik, karakteristik energi angin, kerapatan energi angin, karakteristik turbin angin, konsep dasar desain turbin angin
- Karakteristik tenaga air dan turbin air: review energi potensial, karakteristik tenaga air, karakteristik turbin air, konsep dasar desain turbin air
- Sistem pembangkit listrik skala kecil: peruntukan dan karakteristik sistem pembangkit listrik dengan energi terbarukan: rumah tunggal, komunitas, peralatan komunikasi; jenis stand-alone, hybrid; konsep dasar dan desain sistem
- Sistem penyimpan energi: jenis-jenis sistem penyimpan energi, jenis battery, karakteristik battery, metode charging battery
- Sistem Pengaman dan Kontrol: Sistem pengaman utama: overcurrent, short circuit, overcharged-discharged; Sistem kontrol analog, berbasis software, berbasis kecerdasan buatan untuk battery charged-discharged, dispatch strategy, optimisasi
- Studi kelayakan dan analisis ekonomi: potensi sumber energi terbarukan, potensi sosial, rencana sistem kelistrikan, rencana manajemen pengelolaan; Metode Present Value untuk analisis Simple Payback Period, Internal Rate of Return.
- *Basic concept of energy and environment: review and projection of world and national energy resources and consumption; Usage and potence of fossil energy and renewable energy; Global warming and its effect on environment; world energy policy, national energy management.*
- *Characteristics of solar energy and photovoltaic, characteristics of wind energy and wind turbine, characteristics of hydro energy and hydro turbine.*
- *Small scale electrical power generation: usage and characteristics of renewable electrical power generation: individual, residences, communication devices; stand alone and hybrid system; basic concept and system design*
- *Storage energy system: Types of storage energy system, Type, characteristics and charging method of battere.*
- *Protection system and contro: Main protection system:*

	<i>overcurrent, overcharged-discharged; Analog control system and control system based on artificial intelligent for charged-discharged battere, dispatch strategy, optimization</i> • <i>Feasibility study and economic analysis: Potence of renewable energy resources, social potence, management planning, present value methode of simple payback period analysis, internal rate of return</i>
PUSTAKA UTAMA/ REFERENCES	•

SILABUS KURIKULUM/COURSE SYLLABUS

MATA KULIAH/ COURSE TITLE	TE091332: Komunikasi Data TE091332: <i>Data Communication</i> Credits: 2 Semester: 3
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Untuk mengetahui prinsip proses pengiriman data dimulai dari sejarah perkembangannya sampai pada proses komunikasi data yang terjadi pada lapisan fisik dan lapisan data link. Pengenalan lapisan fisik ditunjukkan dengan pembahasan karakteristik beberapa jenis media transmisi dan standard interfacenya. Pembahasan lapisan data link dimulai dengan pengenalan beberapa jenis protokol untuk mengatur komunikasi data. <i>To understand principle of data communication process start from the historical evolution up to data communication process at the physical and data link layer. Describing the physical layer concerned with the electrical characteristics and its interface standard. While the data link layer describes a few types of protocols to control data communication.</i>
KOMPETENSI/ COMPETENCY	• Memahami teknik dan terminologi yang berkaitan dengan komunikasi data • Memahami proses komunikasi data yang terjadi pada lapisan fisik • Memahami proses komunikasi data yang terjadi pada lapisan data link • <i>Understanding of techniques and terminologies related to data communication</i> • <i>Understanding of data communication process at the physical layer</i> • <i>Understanding of data communication process at the data link layer</i>
POKOK BAHASAN/ SUBJECTS	• Membahas sejarah perkembangan sistem computer yang terdistribusi yang berpengaruh pada perkembangan data komunikasi sekarang • Fokus pada topik mengenai karakteristik dan teori lain yang menentukan penggunaan beberapa macam tipe media transmisi fisik • Membahas beberapa teknik yang dapat dipergunakan oleh penerima untuk mengetahui awal dan akhir dari data yang dikirimkan dan mengetahui jika terjadi kesalahan pengiriman • Menerangkan beberapa teknik yang dipergunakan untuk mengurangi pengaruh kesalahan transmisi dan mengatur

	kecepatan alir data pada lapisan data link • Membahas standar protokol data link untuk mengatur pertukaran data • <i>Describes the historical evolution of distributed computing system that influenced the current development of data communication</i> • <i>Concerned with the electrical characteristics and other theories that determine the use of different types of physical transmission medium</i> • <i>Describes various techniques that enable the receiver determines the start and end of transmitted block and any errors occurred during transmission</i> • <i>Presents different techniques used to overcome effects of transmission errors and control the rate of flow of data across a data link</i> • <i>Describes standard data link protocols to control the exchange of data</i>
PUSTAKA UTAMA/ REFERENCES	• Stallings, W., <u>Data and Computer Communications</u>, Upper Saddle River, NJ, USA, Prentice Hall, 2007 • Halsall, F., <u>Data Communications, Computer Networks and Open Systems</u>, Wokingham, England, Addison Wesley, 1996 • Rappaport, T.S., <u>Wireless Communications, Principles and Practice</u>, Upper Saddle River, NJ, USA, Prentice Hall, 2002

MATA KULIAH/ COURSE TITLE	TE091342: Pengolahan Sinyal Digital TE091342: Digital Signal Processing Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari representasi sinyal-sinyal digital pada domain waktu dan frekuensi, teknik-teknik pengolahan sinyal digital, analisa dan karakterisasi sistem. <i>To study representation of digital signals in time and frequency domains, digital signal processing techniques and system characterization and analysis.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu memahami: • Representasi sinyal-sinyal digital pada domain waktu dan frekuensi • Sistem digital linier dan time-invariant • Transformasi z untuk analisa sinyal dan sistem • Desain filter digital FIR dan IIR <i>The students will be able to understand:</i> • <i>Digital signal representation in time and frequency domain</i> • <i>Linear and time-invariant digital signal</i> • <i>z-Transform for signal and system analysis</i> • <i>Digital filter design: FIR & IIR</i>
POKOK BAHASAN/ SUBJECTS	• Sinyal waktu diskrit, sistem linier dan time-invariant, representasi urutan dengan transformasi Fourier • Transformasi-z, daerah konvergensi, transformasi-z invers, sifat-sifat transformasi-z • Sampling sinyal waktu kontinyu • Analisa transformasi sistem LTI: tanggapan frekuensi, sistem dalam bentuk persamaan beda linier dengan koefisien konstan, sistem all-pass, sistem fase minimum • Struktur sistem waktu-diskrit: bentuk langsung, kaskade, paralel, transpos • Desain filter FIR: teknik windowing, metode window Kaiser • Desain filter IIR: filter analog, desain impulse-invariance, transformasi bilinear • <i>Discrete-time signal, linear and time-invariant system, sequence representation using Fourier transform</i> • <i>Z-Transform: region of convergence, inverse z-transform, z-transform properties</i> • <i>Sampling of continuous time signals</i>

	• <i>Transform analysis of LTI system: frequency response, linear constant coefficients difference equations, all-pass system, minimum phase system</i> • <i>Discrete-time system structure: direct forms, cascade, parallel, transpose</i> • <i>FIR filter design: windowing techniques, Kaiser window method</i> • <i>IIR filter design: analog filters, impulsive-invariance principle, bilinear transformation</i>
PUSTAKA UTAMA/ REFERENCES	• Alan V. Oppenheim, Ronald W. Schaffer & John R. Buck, "<u>Discrete-Time Signal Processing</u>," 2nd ed., Prentice Hall, 1999. • Paulo S.R. Diniz, Eduardo A.B. da Silva, & Sergio L. Netto, "<u>Digital Signal Processing: System Analysis and Design</u>," Cambridge University Press, 2002.

MATA KULIAH/ COURSE TITLE	TE091421: Sistem Komunikasi Digital TE091421: <i>Digital Communication System</i> Credits: 5 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari dasar-dasar teori informasi, prinsip-prinsip dan teknik-teknik sistem komunikasi digital. <i>To study basics of information theory, principles of and techniques used in digital communication system</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu memahami: • Prinsip dasar teori informasi dan penerapan untuk karakterisasi sumber dan penghitungan kapasitas kanal • Konsep-konsep dasar ruang sinyal serta kaitannya dengan pengiriman dan penerimaan informasi • Teknik-teknik pengiriman informasi pada kanal baseband dan bandpass, serta analisa unjuk kerja masing-masing teknik. <i>The students are expected to understand:</i> • <i>Principles of information theory and its application for source characterization and channel capacity computation</i> • <i>Signal space concepts and its use in the information transmission and reception</i> • <i>Information transmission techniques for baseband and bandpass channel, as well as performance analysis of discussed techniques</i>
POKOK BAHASAN/ SUBJECTS	• Entropi sumber; mutual information; kapasitas kanal; AEP dan teorema pengkodean sumber; kode dengan panjang bervariasi (VLC) • Teknik-teknik modulasi digital: modulasi linier, modulasi orthogonal dan biorthogonal; spektrum modulasi digital • Teknik-teknik demodulasi: ruang sinyal, uji hipotesa, penerima optimal pada kanal AWGN, deteksi ML; desain dan analisa penerima untuk kanal AWGN • Ekualisasi kanal: model kanal, diagram mata, estimasi urutan ML; equalizer linier, DFE • <i>Source entropy: mutual information; channel capacity; AEP and source coding theorems; variable length code (VLC)</i> • <i>Digital modulation techniques: linear modulation; orthogonal and biorthogonal modulation; spectral occupancy of digital modulation.</i> • <i>Demodulation techniques: signal space; hypothesis testing; optimal receiver in AWGN channel, ML detection; receiver design and</i>

	<i>performance analysis for AWGN channel</i> • <i>Channel equalization: channel model, eye diagram, maximum likelihood sequence estimation; linear equalizer, DFE.</i>
PUSTAKA UTAMA/ REFERENCES	• Bernard Sklar, "<u>Digital Communications: Fundamentals & Applications</u>," 2nd ed., Prentice Hall, 2001. • John G. Proakis & Masoud Salehi, "<u>Digital Communications</u>," 5th ed., McGraw-Hill, 2007. Artikel-artikel dari jurnal ilmiah: • IEEE Trans. on Communications • IEEE Trans. on Wireless Communications <i>Articles from above technical journals.</i>

MATA KULIAH/ COURSE TITLE	TE091423: Jaringan dan Rekayasa Trafik TE091423: <i>Networks and Traffic Engineering</i> Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari karakterisasi trafik pada jaringan komunikasi serta teknik-teknik dan protokol yang digunakan untuk pengiriman informasi yang melibatkan banyak sumber dan tujuan, serta analisa unjuk kerja jaringan. <i>To study traffic characteristics in communication network, as well as techniques and protocols used for information transport from multiple source to multiple destination and network performance analysis.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu: • Memahami dasar-dasar, analisa dan penerapan rekayasa trafik dalam rancangan jaringan telekomunikasi • Memahami prinsip kerja dan arsitektur router pada Internet • Memahami teknik-teknik routing dan protokol yang digunakan pada jaringan IP <i>The students are expected:</i> • <i>To understand basics of traffic and the application of traffic engineering for design of telecommunication network</i> • <i>To understand principles and architectures of router for IP network</i> • <i>TO understand routing techniques and protocols used for IP network</i>
POKOK BAHASAN/ SUBJECTS	• Definisi trafik, satuan trafik, macam-macam trafik, karakteristik trafik; Model-model trafik: Trafik voice, trafik data; Sistem Kegagalan; model sistem, Erlang B, probabilitas blocking, penentuan sirkit. • Peramalan demand dan peramalan trafik; QoS jaringan nirkabel; Proses Markov, rantai Markov, Sistem tunggu (queueing system) : sistem dengan antrian tak terbatas (Erlang C) dan sistem dg antrian terbatas, probabilitas tunggu, probabilitas blocking. • Arsitektur router internet, Token leaky bucket, multiplexing flow, • Jaringan antrian dengan routing statis, jaringan rugi, jaringan antrian stable open, Routing dinamis dan routing dengan insentif, Algoritma shortest path dan widest path. • <i>Traffic definition, traffic unit, traffic characteristics. Traffic models: voice and data. Loss system; systemmodel, Erlang B; blocking probability, circuit dimensioning.</i> • <i>Demand and traffic forecast; wireless network QoS; Markov process and chain. Queueing system; system with infinite queue (Erlang C) and with finite queue; waiting probability, blocking</i>

	<i>probability.</i> • <i>Internet router architectures, token leaky bucket, multiplexing flow.</i> • <i>Queueing network with static routing, loss network, stable open queueing network; dynamic routing and routing with incentive; shortest path and widest path algorithm.</i>
PUSTAKA UTAMA/ REFERENCES	• Kesidis, G., "<u>An introduction to Communication Network Analysis</u>", Wiley, 2007. • Medhi, D. dan Ramasamy, K. "<u>Network Routing</u>", The Morgan Kaufmann Series, 2007. • Chuah, M.C. dan Zhang, Q., "<u>Design and Performance 3G Wireless Networks and Wireless LANs</u>", Springer, 2006. • ITU-D, "<u>Teletraffic Engineering Handbook</u>", 2003

MATA KULIAH/ COURSE TITLE	TE091425: Pengolahan Sinyal Multimedia TE091425: <i>Multimedia Signal Processing</i> Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari berbagai jenis sinyal multimedia, beserta karakteristiknya, dan teknik-teknik untuk kompresi dan pengkodean sinyal multimedia untuk komunikasi dan distribusi di jaringan. <i>To study various multimedia signals and their characteristics, as well as compression and coding techniques for multimedia communication and distribution in networks.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan memahami: • Representasi, karakteristik dan prinsip pembangkitan sinyal-sinyal multimedia: suara, citra dan video, serta kaitannya dengan karakteristik sistem penginderaan manusia • Teknik-teknik pengolahan dan pengkodean sinyal multimedia untuk penyimpanan dan pengiriman secara lebih efisien, terutama dalam konteks teori informasi <i>The students are expected:</i> • <i>To understand the representation, the characteristics and the basic principles of generation of multimedia signals: speech, image and video, as well as their relation with human perception system.</i> • <i>To understand multimedia signal processing dan coding techniques for efficient storage and trasmission, within the context of information theory.</i>
POKOK BAHASAN/ SUBJECTS	• Representasi citra digital, model pembangkitan citra, sistem penglihatan manusia, representasi warna, color matching function, diagram khromatisitas. • Karakteristik sinyal wicara, model pembangkitan sinyal wicara, sistem pendengaran manusia, • Kompresi tanpa rugi-rugi, pengkodean entropik: run-length coding, Shannon-Fano, Huffman, dan aritmatika; pengkodean transformasi: DCT & wavelet, kuantisasi skalar dan vektoriel. • Standar JPEG, dasar-dasar video analog dan digital. Estimasi gerakan pada video dan teknik kompresi berbasis kompensasi gerakan, standar kompresi video: H.263 dan MPEG-1/2, pengkodean dengan skalabilitas. • <i>Digital image representation, models of imaging systems, human visual system, color representation, color matching function, chromaticity diagram.</i> • <i>Speech characteristics and generation models, human hearing system.</i>

	• <i>Losless compression, entropic coding: RLC, Shannon-Fano, Huffman and arithmetic coding; transform coding: DCT and wavelet; scalar and vectoriel quantization.</i> • <i>JPEG Standards; introduction to analog and digital video. Motion estimation and motion compensation tecniques for video compression. Video compression standards: H.263 and MPEG-1/2/4; scalable coding.</i>
PUSTAKA UTAMA/ REFERENCES	• Ze-Nian Li & Mark S. Drew, <u>Fundamentals of Multimedia</u>, Prentice Hall, 2002. • Andreas Spanias, Ted Painter & Venkattraman Atti, <u>Audio Signal Processing and Coding</u>, John Wiley & Sons, 2007. • K.R. Rao, Z.S. Bojkovic & D.A. Milovanovic, <u>Introduction to Multimedia Communications: Applications, Middleware, Networking</u>, John Wiley & Sons, 2006. • Journal of <u>IEEE Transaction on Multimedia</u>

MATA KULIAH/ COURSE TITLE	TE091427: Antena & Propagasi Elektromagnetik TE091427: <i>Antenna & Electromagnetic Propagation</i> Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami konsep dan dapat menganalisa perambatan gelombang pada saluran transmisi. • Mahasiswa memahami konsep dan dapat menganalisa perambatan gelombang datar serbasama saat melalui 2 atau lebih medium yang berbeda dengan kedatangan normal dan menyudut. • Mahasiswa memahami konsep radiasi antenna, dan parameter-parameter antenna. • Mahasiswa memahami konsep antenna array linier, dapat menganalisa karakteristik radiasinya dan memahami konsep pembentukan beam menggunakan antenna array. • Mahasiswa memahami konsep perambatan gelombang EM pada siskom radio, memahami pengaruh terrain dan atmosfer dan dapat memprediksi redaman yang disebabkan oleh terrain dan atmosfer. • <i>Student comprehends the concept of and is able to analyze wave propagation in a transmission line.</i> • <i>Student comprehends the concept of and is able to analyze the propagation of uniform plane wave through multiple media with various incident angles.</i> • <i>Student comprehends the concept of antenna radiation and parameters.</i> • <i>Student comprehends the concept of linear array antenna, is able to analyze its radiation characteristics and comprehends the concept of beamforming.</i> • <i>Student comprehends the concept of EM wave propagation in radio communication systems and the effects of terrain and atmosphere, and is able to predict losses due to terrain and atmosphere.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menggunakan konsep perambatan gelombang EM untuk menganalisa dan mendisain sistem transmisi menggunakan suatu saluran transmisi. • Mahasiswa dapat menggunakan konsep perambatan gelombang di 2 atau lebih medium yang berbeda pada suatu transmisi gelombang radio. • Mahasiswa mampu mendapatkan medan radiasi EM dari antenna sederhana secara analitik dan numeric, mampu menurunkan parameter-parameter antenna untuk antenna sederhana.

	• Mahasiswa dapat mendisain karakteristik radiasi tertentu menggunakan antenna array. • Mahasiswa dapat menggunakan konsep perambatan gelombang EM pada sis-kom radio untuk menganalisa dan mendisain suatu link sis-kom radio. • <i>Student is able to apply the concept of EM wave propagation to analyze and design transmission system using a transmission line.</i> • <i>Student is able to apply the concept of wave propagation in multiple media in radio wave transmission.</i> • <i>Student is able to compute EM radiation from a simple antenna analytically and numerically and to derive parameters of a simple antenna.</i> • <i>Student is able to design specified radiation characteristics using array antennas.</i> • <i>Student is able to apply the concept of EM wave propagation to analyze and design radio communication links.</i>
POKOK BAHASAN/ SUBJECTS	• Perambatan gelombang datar serbasama melalui beberapa medium dengan kedatangan normal : koefisien pantulan, koefisien transmisi, VSWR • Perambatan gelombang datar serbasama melalui beberapa medium dengan kedatangan menyudut : • Integral radiasi, parameter antenna : pola radiasi, intensitas radiasi, beam solid angle, directivity, gain, effective aperture, efisiensi, impedansi. • Array linier uniform spacing and amplitude : array factor, prinsip perkalian pola, beam scanning dengan pengaturan fase. • Spektrum frekuensi radio, gelombang ruang, gelombang tanah, gelombang langit. Efek terrain : difraksi, pantulan. Efek atmosfer : pembiasan, penyerapan, hamburan. • <i>Uniform plane wave propagation through multiple media with normal incidence: reflection coefficient, transmission coefficient, VSWR.</i> • <i>Uniform plane wave propagation through multiple media with angular incidence.</i> • <i>Radiation integral, antenna parameters: radiation pattern, radiation intensity, solid angle beam, directivity, gain, effective aperture, efficiency, impedance.</i> • <i>Linear array with uniform spacing and amplitude: array factor, pattern multiplication, beam scanning with phase adjustment.</i> • <i>Radio frequency spectrum, space wave, ground wave, sky wave. Terrain effects: reflection, diffraction. Atmospheric effects: refraction, absorption, scattering.</i>
PUSTAKA	• J. D. Krauss & R. Marhefka, <u>Antennas for All Applications</u>, McGraw-

**UTAMA/
REFERENCES**

Hill, 2001.

- C. A. Balanis, Antenna Theory, John Wiley & Sons, 1997.
- J. D. Parsons, Mobile radio propagation channel,
- R. L. Freeman, Radio System Design for Telecommunications (1 – 100 GHz), John Wiley and Sons, 1987.
- K. Siwiak, Radiowave Propagation and Antennas for Personal Communications, Artech House, 1995.

MATA KULIAH/ COURSE TITLE	TE091429: Sistem Komunikasi Nirkabel TE091429: <i>Wireless Communication System</i> Credits: 4 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami prinsip kerja sistem komunikasi nirkabel. • Mahasiswa memahami aspek propagasi dan transmisi pada sistem komunikasi nirkabel. • Mahasiswa memahami jaringan pada sistem komunikasi nirkabel. • <i>Student comprehends the principles of wireless communications.</i> • <i>Student comprehends the propagation and transmission aspects of wireless communications</i> • <i>Student comprehends networking aspects of wireless communications.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisis kinerja sistem dan jaringan komunikasi nirkabel. • Mahasiswa mampu merencanakan dan merekayasa sistem dan jaringan komunikasi nirkabel. • <i>Student is able to analyze the performance of wireless communication systems and networks.</i> • <i>Student is able to design and engineer wireless communication systems and networks.</i>
POKOK BAHASAN/ SUBJECTS	• Karakteristisasi dan pemodelan statistik kanal propagasi radio: redaman lintasan pada berbagai lingkungan nirkabel, model rugirugi shadowing, coverage, model kanal multipath fading, model respon impuls kanal yang berubah terhadap waktu, delay spread dan Doppler spread, pengukuran dan simulasi kanal fading; • jaringan seluler dan sistem akses jamak: konsep jaringan seluler, jaringan akses dan interkoneksi dengan jaringan kabel: jaringan BTS, MSC; channel assignment, handover; jaringan pensinyalan; metode akses jamak; interferensi dan kapasitas kanal: sektorisasi, karakterisasi, interferensi kanal bersama, kinerja SIR dan kapasitas trafik seluler; • kinerja modulasi digital pada sistem komunikasi bergerak: review sistem modulasi digital dan kinerja pada kanal AWGN, kinerja pada lingkungan fading dan berinterferensi; aplikasi teknik diversity, ekualisasi adaptif, dan pengkodean untuk sistem komunikasi bergerak: prinsip, jenis dan kinerja sistem diversity combinig, berbagai teknik ekualisasi adaptif, pengkodean blok

	dan konvolusi, interleaving; • contoh-contoh sistem dan standar jaringan nirkabel: sistem seluler bergerak 1G, 2G, 3G, TDMA (GSM), CDMA (IS-95), UMTS, sistem pita lebar tidak bergerak (MMDS), WLAN (IEEE 802.11), WPAN (Bluetooth); aplikasi dan layanan komunikasi bergerak: SMS, WAP, GPRS dan lain-lain. • <i>Statistical characterization and modelling of radio propagation channels: path loss in various environments, shadowing loss models, coverage, multipath fading channel models, time-varying channel impulse response models, delay spread and Doppler spread, measurement and simulation of fading channels.</i> • <i>Cellular networks and multiple access: cellular concept, access network and interconnection with wired network, channel assignment, handover, signaling, multiple access methods, sectorization, co-channel interference, cellular traffic capacity.</i> • <i>Performance of digital communications in mobile and wireless systems: performance in fading channels with interference, diversity, adaptive equalization, coding and interleaving.</i> • <i>Wireless systems and standards: mobile cellular systems, broadband wireless systems, mobile data communication applications.</i>
PUSTAKA UTAMA/ REFERENCES	• K. Pahlavan, A.H. Levesque, "<u>Wireless Information Networks</u>", 2nd ed., John Wiley and Sons, 2005. • D. Tse, P. Viswanath, "<u>Fundamentals of Wireless Communications</u>", Cambridge University Press, 2005. • T.S. Rappaport, "<u>Wireless Communications Principles and Practices</u>", 2nd ed., Prentice-Hall, 2002. • W.C.Y. Lee, "<u>Mobile Communications Design Fundamentals</u>", John Wiley and Sons, 1993. • W.C. Jakes, "<u>Microwave Mobile Communications</u>", IEEE Press, 1994.

**MATA
KULIAH/
COURSE TITLE**

TE091430: Sistem Broadcasting

TE091430: *Broadcasting System*

Credits: 3

Semester: VI

**TUJUAN
PEMBELAJARAN/
LEARNING
OBJECTIVES**

Bidang broadcasting merupakan satu cabang dari teknologi informasi dan komunikasi. Di mata-kuliah ini diajarkan aspek-aspek dasar dari sistem broadcasting yang meliputi definisi broadcasting, informasi dan multimedia, aspek teknis broadcast analog untuk suara dan televisi, aspek teknik broadcast digital, digital audio dan televisi digital, termasuk sistem broadcast melalui jaringan IP dan podcasting. Kuliah ditutup dengan regulasi internasional dan nasional terkait broadcasting dan broadcasting ethic.

Broadcasting is a branch of Information and Communication Technologies. In this course, we learn the basic aspects of broadcasting system, including the definition, information and multimedia, technical aspect of analog broadcasting of audio and television, technical aspect of digital broadcasting for audio and video, IP broadcasting and podcasting. Broadcasting regulations and broadcasting ethics will be also covered..

**KOMPETENSI/
COMPETENCY**

- Memahami definisi dan berbagai aspek terkait sistem broadcast
- Mengerti implementasi sistem sistem broadcast sebagai konvergensi bidang komunikasi dan teknik telekomunikasi.
- Menguasai aspek teknik dan teknologi broadcasting analog dan digital serta regulasi dan etika yang mengaturnya.

By this course, student will have good competence to know the definition and basic aspect of broadcasting system; to understand how to implement a broadcasting system as part of communication and telecommunication convergence; mastering all technical and technology aspect of analog and digital broadcasting including regulation and ethics.

**POKOK
BAHASAN/
SUBJECTS**

- Definisi dan aspek dasar Sistem broadcasting.
- Teknik broadcast analog (radio AM, FM, Televisi Analog), Teknik Modulasi dalam dan Sistem Pemancar Broadcasting Analog Audio dan Televisi Analog.
- Teknik broadcast digital (DAB, DVB, IPTV), Pengolahan sinyal dan pengkodean dalam broadcasting, Sistem Pemancar Broadcasting digital Audio dan TV digital.

	• Regulasi dan etika bidang broadcasting • Pengukuran Broadcasting <i>We have five subject: (1) broadcasting system definition and basic aspects, (2) Analog broadcasting techniques, (3) Digital broadcasting techniques, (4) Regulation and ethics, and (5) Measurement of Broadcasting system.</i>
PUSTAKA UTAMA/ REFERENCES	• Endroyono, "<u>Handout Sistem Broadcasting</u>", hand-out JTE-FTI-ITS, 2008 • Gamantyo dkk, "<u>Sistem televisi digital di Indonesia</u>", 2007 • Walter Fisher, "<u>Digital Television : a practical guide for engineer</u>", Rohde & Schwarz, 2004 • Jerry D. Gibson et al., "<u>Digital Compression for Multimedia</u>", Morgan K, 1998 • SK. Keputusan Menteri Perhubungan dan Kominfo tentang Penyiaran. • Fogiel M., "The Electronic Communication Problem Solver", REA, 1984 • Andrew F. Inglis, "<u>Video Engineering</u>", McGraw-hill Inc., 1993 • Internet : wikipedia, DVB.org, dll.

MATA KULIAH/ COURSE TITLE	TE091431: Standar & Regulasi Telekomunikasi TE091431: <i>Telecommunications Standards & Regulations</i> Credits: 2 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Menguasai emampuan untuk menerapkan standar dan regulasi di bidang Telekomunikasi di Indonesia & dunia International <i>To acquire the capability for the applied of telecommunication standard and regulation in Indonesia & International</i>
KOMPETENSI/ COMPETENCY	• Pengetahuan tentang standard dan regulasi di bidang telekomunikasi di Indonesia & International • Keterampilan dalam penerapan standard dan regulasi • Sikap untuk patuh terhadap standard dan regulasi • Sifat-sifat pribadi untuk ikut mengembangkan standard & regulasi • <i>Knowledge, skills and attitude in students an awareness of telecommunication standard and regulation in Indonesia & International</i>
POKOK BAHASAN/ SUBJECTS	• Pengertian standar dan regulasi di bidang telekomunikasi, frekuensi dan standard & perizinan di Indonesia • International Telecommunication Union, Radiocommunication & Telecommunication standardization. • Spectrum Management, Broadcasting Services, Propagation, Fixed Services, Satellite Services & Mobile Services. • Overall network operation, transmission system and media, switching and signalling & protection against interference. • <i>Understanding of telecommunication standard and regulation & permitsin Indonesia</i> • <i>International Telecommunication Union, Radiocommunication & Telecommunication standardization.</i> • <i>Spectrum Management, Broadcasting Services, Propagation, Fixed Services, Satellite Services & Mobile Services.</i> • <i>Overall network operation, transmission system and media, switching and signalling & protection against interference.</i>
PUSTAKA UTAMA/ REFERENCES	• www.itu.int • www.postel.go.id

**MATA
KULIAH/
COURSE TITLE**

TE091432: Elektronika Telekomunikasi

TE091432: *Communication Electronics*

Credits: 3

Semester: VI

**TUJUAN
PEMBELAJARAN/
LEARNING
OBJECTIVES**

Materi kuliah ditekankan pada penerapan teori medan dan gelombang elektromagnetik untuk disain rangkaian elektronika frekuensi tinggi. Diawali dengan memahami karakteristik saluran transmisi di frekuensi tinggi, review smith-chart, impedance matching, scattering parameter pada rangkaian n-ports, aspect disain microwave amplifier, perhitungan gain dan stabilitas, dasar oscillator RF dan komponen pasif RF, pengukuran RF.

The objective of this course is to learn electronic design for radio frequency. Electronic RF design will be an implementation of field theory and Electromagnetic in electronics. The course started with a review of transmission line and high frequency behavior, continued by smith-chart review, scattering parameter for n-ports network, matching impedance, microwave amplifier design, gain and stability, basic oscillator RF, RF pasif component and Electronic RF measurement.

**KOMPETENSI/
COMPETENCY**

- Mengetahui perbedaan utama antara elektronika frekuensi rendah dan frekuensi tinggi
- Memahami berbagai aspek teori dan penerapan rangkaian elektronika frekuensi tinggi, dari disain hingga pengukuran
- Mampu melakukan disain amplifier RF

By this course, student will have good knowledge about the difference of low frequency and high frequency electronic design. Student will understand theoretical and implementation aspects of electronic RF from design to measurement. Students will have good competence to design RF Amplifier.

**POKOK
BAHASAN/
SUBJECTS**

- Review teori medan dan gelombang elektromagnetik pada disain rangkaian elektronika frekuensi tinggi, terutama karakteristik saluran transmisi di frekuensi tinggi,
- Review smith-chart, scattering parameter pada rangkaian n-ports, dan impedance matching,
- Disain microwave amplifier, perhitungan gain dan stabilitas,
- Dasar oscillator RF dan komponen pasif RF,
- Design presentation and pengukuran RF.

We have at least five subject: (1) electromagnetic and high frequency transmission line, (2) smith-chart review, scattering parameter for n-ports network, matching impedance, (3) microwave amplifier design,

	<i>gain and stability, (4) basic oscillator RF, RF pasif component, and (5) design presentation and Electronic RF measurement..</i>
PUSTAKA UTAMA/ REFERENCES	• Reinhold Ludwig and Pavel Bretchko "<u>RF circuit design - Theory and applications</u>", Pearson Education, IE, Prentice-Hall, 2000 • Samuel Y. Liao, "<u>Microwave Circuit Analysis and Amplifier Design</u>", Prentice-Hall International, 1987. • <u>Matlab files for RF circuit design - Theory and applications</u> • Endroyono, "<u>Handout Elektronika Telekomunikasi</u>", ITS-2009

MATA KULIAH/ COURSE TITLE	TE091433: Rekayasa Internet TE091433: <i>Internet Engineering</i> Credits: 4 Semester: VII
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari tentang arsitektur dan berbagai jenis protokol yang digunakan pada Internet serta pemodelan dari struktur jaringan Web dan teknik-teknik untuk menganalisa berbagai content yang terdapat di Internet. <i>To study architectures and various protocols used in Internet and modelling of network structure, as well as techniques to analyze content in the Internet.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu: • Memahami arsitektur dan berbagai jenis protokol yang digunakan pada Internet • Memahami pemodelan dari struktur jaringan Web dan teknik-teknik untuk menganalisa berbagai content yang terdapat di Internet • <i>To understand architectures and various protocols in the Internet</i> • <i>To understand modelling of network structure in the Web and techniques to analyze content in the Internet.</i>
POKOK BAHASAN/ SUBJECTS	• IPv4, pengalaman: address space, broadcast address, NAT, implementasi, ICMP; unicast dan multicast, IGMP. Pengalaman pada IPv6, packet format, interoperasi antara IPv4 dan IPv6. • Teknik-teknik routing dan forwarding, sistem autonomous, routing table; informasi routing terdistribusi: vektor jarak, link state routing, penghitungan lintasan, OSPF, rekayasa trafik, RIP, IS-IS, BGP-4, multicast. • Manajemen layanan: DiffServ, integrated services, RSVP. Protokol-protokol transport: UDP, TCP, SCTP & RTP. Rekayasa trafik, ECMP, routing IP flows, service-based routing; offline & dynamic traffic engineering. • Dasar-dasar MPLS, pelabelan paket, pemetaan data, protokol pensinyalan, LDP, rekayasa trafik, GMPLS. Switch terdistribusi, GSPM, konfigurasi switch, manajemen port dan koneksi. • Protokol-protokol aplikasi: DNS, host, DNS message format, Telnet, FTP, HTTP. Dokumen-dokumen Web: SGML dan HTML; resource identifiers: URI, URL, URN; log files & search engines. Representasi Web dengan graph: power-law connectivity, jaringan small-world, model pembangkitan untuk web graph. Pengindeksan teks, pengolahan leksikal, content-based ranking, latent semantic analysis, document clustering.

	• Teknik-teknik analisa link, matriks nonnegative, eigenvector dominan, PageRank, stabilitas dan analisa link secara probabilistic; teknik-teknik crawling: selective dan distributed; dinamika Web. • <i>IPv4, addressing: address space, broadcast address, NAT, implementation, ICMP; unicast and multicast, IGMP. Addressing in IPv6, packet format, interoperation between IPv4 and IPv6.</i> • <i>Routing and forwarding techniques, autonomous system, routing table; distributed routing information: distance vector, link state routing, path computation, OSPF, traffic engineering, RIP, IS-IS, BGP-4, multicast.</i> • <i>Service management: Diffserv, integrated services, RSVP. Transport protocols: UDP, TCP, SCTP & RTP. ECMP, routing IP flows, service-based routing; offline & dynamic traffic engineering.</i> • <i>Introduction to MPLS, packet labelling, data mapping, signalling protocol, LDP, traffic engineering, GMPLS, distributed switch, GSMP, switch configuration, port and connection management.</i> • <i>Application protocols: DNS, host, DNS message format, Telnet, FTP, HTTP. Web documents: SGML dan HTML; resource identifiers: URI, URL, URN; log files & search engines. Web representation using graph: power-law connectivity, small-world network, generation model for web graph. Text indexing, lexical processing, content-based ranking, latent semantic analysis, document clustering.</i> • <i>Link analysis techniques, nonnegative matrix, dominant eigenvector, PageRank, stability of and analysis of link using probabilistic method; crawling techniques: selective and distributed; Web dynamics.</i>
PUSTAKA UTAMA/ REFERENCES	• Adrian Farrel, <u>The Internet and Its Protocols: A Comparative Approach</u>, Morgan Kaufmann, 2004. • Pierre Baldi, Paolo Frasconi & Padhraic Smyth, <u>Modeling the Internet and the Web: Probabilistic Methods and Algorithms</u>, John Wiley & Sons, 2003. • Deepankar Medhi & Karthikeyan Ramasamy, <u>Network Routing: Algorithms, Protocols, and Architectures</u>, Morgan Kaufmann, 2007. • Gustavo Rossi, Oscar Daniel Schwabe & Luis Olsina, eds., <u>Web Engineering: Modelling and Implementing Web Applications</u>, Springer-Verlag, 2008.

MATA KULIAH/ COURSE TITLE	TE091434: Proyek Telekomunikasi TE091434: Telecommunication Project Credits: 3 Semester: VII
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Memberi pemahaman mengenai konsep perencanaan dan rekayasa sistem dan jaringan telekomunikasi secara integral (lapisan 1, 2, dan 3). • Memberi ketrampilan perencanaan dan rekayasa sistem dan jaringan telekomunikasi. • Memberi pemahaman dan ketrampilan mengenai manajemen proyek bidang telekomunikasi. • Memberi pemahaman dan ketrampilan penyusunan proposal dan laporan proyek telekomunikasi. • <i>To provide students with comprehension of the concept of integrated planning and engineering of communication system and network.</i> • <i>To equip students with skills for planning and engineering of communication system and network.</i> • <i>To provide students with comprehension and skills in telecommunication project management.</i> • <i>To provide students with comprehension and skills in writing proposal and report of telecommunication project.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu melakukan perencanaan dan rekayasa sistem dan jaringan telekomunikasi secara integral. • Mahasiswa mampu menerapkan manajemen proyek di bidang telekomunikasi. • Mahasiswa mampu menyusun dan mempresentasikan proposal dan laporan proyek telekomunikasi. • <i>Student is able to design and engineer telecommunication systems and networks.</i> • <i>Student is able to apply project management in the field of telecommunications.</i> • <i>Student is able to write and present proposals and reports of telecommunication projects.</i>
POKOK BAHASAN/ SUBJECTS	• Review propagasi radio, sistem komunikasi digital, pengolahan sinyal multimedia, jaringan komputer, trafik, manajemen jaringan, standar dan regulasi. • Riset operasi: pemrograman linear, teori graf, minimum spanning tree, critical path method.

	• Desain dan optimasi jaringan telekomunikasi. • Jenis-jenis proyek di bidang telekomunikasi. • Manajemen proyek telekomunikasi: manajemen ruang lingkup, manajemen waktu dan biaya, manajemen kualitas, manajemen risiko. • Proposal dan laporan proyek telekomunikasi. • <i>Review of radio propagation, digital communications, multimedia signal processing, computer networks, traffic engineering, network management, standards and regulations.</i> • <i>Basic operatoin research: linear programming, graph theory, minimum spanning tree, critical path method.</i> • <i>Design and optimization of telecommunication network.</i> • <i>Types of projects in telecommunications.</i> • <i>Telecommunication project management: scope management, time and cost management, quality management, risk management.</i>
PUSTAKA UTAMA/ REFERENCES	• Roger L. Freeman, <u>Telecommunication System Engineering</u>, John Wiley and Sons, 2004, ISBN 0471451339, 9780471451334. • Roger Ackerley, <u>Telecommunications Performance Engineering</u>, IET, 2003, ISBN 0863413412, 9780863413414. • Mohammed Ghanbari, <u>Principles of Performance Engineering for Telecommunication and Information Systems</u>, IET, 1997, ISBN 0852968833, 9780852968833. • Celia Desmond, <u>Project Management for Telecommunications Managers</u>, Springer, 2004, ISBN 1402077289, 9781402077289. • Mostafa Hashem Sherif, <u>Managing Projects in Telecommunication Services, For Dummies</u>, 2006, ISBN 0470047674, 9780470047675. • Hamdy A. Taha, <u>Operations Research: An Introduction</u>, 6th ed., Prentice-Hall, 1997.

MATA KULIAH/ COURSE TITLE	TE091435: Lab. Telekomunikasi Multimedia TE091435: Telecommunication Multimedia Lab. Credits: 2 Semester: VII
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memahami penerapan teknik-teknik transmisi informasi pada media, komunikasi data dan pengolahan sinyal digital, baik dengan perangkat percobaan atau secara simulasi. <i>To learn practical implementation of information transmission techniques over various media, data communication techniques and digital signal processing, by using laboratory equipments or through simulation.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu menerapkan: • Teknik-teknik transmisi informasi pada berbagai media • Teknik-teknik komunikasi data • Pembangkitan serta pengolahan sinyal digital <i>The students are able to put into practice:</i> • <i>Transmission techniques of information over various media</i> • <i>Data communication techniques</i> • <i>Generation and processing of digital signal</i>
POKOK BAHASAN/ SUBJECTS	• Pengiriman sinyal pada media terbimbing dan tak terbimbing • Komunikasi data pada link-layer: ARQ, Go-Back-N • Pembangkitan sinyal digital persegi, sinusoida, eksponensial, acak • Pengolahan sinyal digital dengan filter FIR dan IIR • Sampling dan rekonstruksi sinyal digital • <i>Signal transmission over guided and unguided media</i> • <i>Data communication over link layer: ARQ, Go-Back-N</i> • <i>Digital signal generation: rectangular pulse, sinusoid, exponential, random</i> • <i>Digital signal processing using FIR and IIR filters</i> • <i>Sampling and reconstruction</i>
PUSTAKA UTAMA/ REFERENCES	• Fred Halsall, "<u>Computer Networking and the Internet</u>," 5th ed., Addison-Wesley, 2005. • Alan V. Oppenheim, Ronald W. Schafer, & John R. Buck, "<u>Discrete-Time Signal Processing</u>," 2nd ed., Prentice Hall, 1999.

**MATA
KULIAH/
COURSE
TITLE**

TE091520: Sistem Komunikasi & Jaringan Optik
TE091520: *Optic Communcations System & Networks*
Credits: 3
 Semester: Pilihan

**TUJUAN
PEMBELAJARAN/
LEARNING
OBJECTIVES**

Matakuliah ini membahas tentang sistem komunikasi dengan media serat-optik, yang meliputi serat-optik, pemancar optik, detektor optik, aspek disain transmisi analog dan digital, hingga jaringan optik global dan lokal. Yang tidak kalah pentingnya adalah aspek standard dan teknik pengukuran siskom optik.

This course deals with the telecommunication system with fiber-optic media, which include fiber-optics, optical transmitters, optical detectors and other components; the design aspects of analog and digital optical transmission; design of a local and global optical network. Important aspect related to standards and measurement techniques will also be presented.

**KOMPETENSI/
COMPETENCY**

- Mengetahui definisi dan aspek jaringan sistem komunikasi optik, terutama aspek fisik cahaya dan perambatannya.
- Memahami dan mampu memilih media dan parameter yang tepat dalam disain dan aplikasi sistem atau jaringan komunikasi optik.
- Mampu melakukan perencanaan sistem dan jaringan komunikasi optik sesuai dengan regulasi dan mampu melakukan pengukuran kinerja sistem.

By this course, student will have good knowledge about the definition and the aspects of optical communications systems and network, particularly the physical aspects of light and the transmission; understand and be able to select the medias and the appropriate parameters during the design and implementation of optical communication system and networks; be capable to design the of optical communication system and networks in accordance with the regulations and be able to do the performance measurement systems.

**POKOK
BAHASAN/
SUBJECTS**

- Review fisika optik dan dasar perambatan cahaya di serat
- Sistem Komunikasi dan Jaringan Optik : Struktur, bahan dan fabrikasi serat optik, degradasi sinyal di serat optik, penyambungan dan coupling.
- Sumber optik, detektor optik dan karakteristiknya pemancar dan penerima optik.
- Transmisi analog dan digital melalui serat optik. Konsep multiplexing pada siskom optik, WDM amplifier optik. Arsitektur

	dan aplikasi jaringan optik lokal dan global. ○ Regulasi dan pengukuran <i>We have at least five subject: (1) Review the basic optical physics and light propagation in the fiber, (2) Communication Systems and Optical Networks: Structure, materials and fabrication of optical fibers; signal degradation in optical fiber; connectors and coupling, (3) Optical source and detector; characteristics of optical transmitter and receiver. (4) Analog and digital transmission via fiber optics; concept in optical multiplexing, WDM; optical amplifiers; Architecture and applications of local and global optical networks. (5) Regulation and measurement</i>
PUSTAKA UTAMA/ REFERENCES	• Gerd Keiser, "<u>Optical Fiber Communications</u>" 3rd edition, 2000 • Joseph C. Palais, "<u>Fiber Optic Communications</u>", Prentice-Hall, 4th Ed, 1998 • Paul E. Green Jr., "<u>Fiber Optic Network</u>", Prentice-Hall, 1993 • Govind P. Agrawal, "<u>Fiber Optic Communication Systems</u>", Willey Interscience, 1992 • Endroyono dan Hang Soeharto, <u>Handout: Sistem Komunikasi dan Jaringan Optik</u>, Elektro ITS 2009.

MATA KULIAH/ COURSE TITLE	TE091521: Jaringan Mobile and Ad-Hoc TE091521: <i>Mobile and Ad-Hoc Networks</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari berbagai arsitektur dan karakteristik jaringan ad hoc dan mobile, beserta teknik-teknik akses dan routing yang diperlukan, selain aspek keamanan. <i>To study various architecture and characteristics of mobile and ad hoc networks, as well as related access, routing techniques and security aspects.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan memahami: • Karakteristik dan arsitektur jaringan ad hoc • MAC dan unjuk kerja berkaitan dengan berbagai model trafik • Penentuan lokasi dan teknik-teknik terkait • Teknik simulasi jaringan ad hoc <i>The students will understand:</i> • <i>Architectures and characteristics of ad hoc network</i> • <i>MAC and its performances in relation to various traffic models</i> • <i>Localization techniques</i> • <i>Ad hoc network simulation</i>
POKOK BAHASAN/ SUBJECTS	• Medium access control: pemodelan trafik, pemodelan tunda, model antrian, multiple access, demand assigned MA, CSMA, MAC pada jaringan ad hoc • Akses nirkabel ad hoc: jaringan Bluetooth, pencarian simpul, algoritma pembentukan Bluetooth, mode mesh pada WiMAX/802.16 • Pemrograman jaringan nirkabel: struktur informasi, socket, parameter dan control, frame terima dan frame kirim • Protokol jaringan ad hoc: IP routing normal, pendekatan reaktif, pendekatan proaktif, pendekatan hibrida, pengelompokan, QoS, protokol jaringan sensor • Kesadaran tentang lokasi: kedekatan geografik, pembentukan spanner, diseminasi informasi, penentuan lokasi geografik, graf lingkaran satu acak, cakupan dan konektivitas • Keamanan jaringan ad hoc: teknik-teknik otentifikasi, serangan lapis fisik, protokol aplikasi keamanan, keamanan routing, keamanan broadcast, verifikasi lokasi yang aman

	• <i>Medium access control: traffic modeling, delay model, queueing models, multiple access, demand assigned MA, CSMA, MAC in adhoc network</i> • <i>Ad hoc wireless access: Bluetooth networks, node discovery, Bluetooth formation algorithms, mesh mode of WiMAX/802.16</i> • <i>Wireless network programming: structure of information, socket, parameters and control, receiving frames, sending frames</i> • <i>Ad hoc network protocols: normal IP routing, reactive approach, proactive approach, hybrid approach, clustering, QoS, sensor network protocols</i> • <i>Location awareness: geographic proximity, constructing spanner, information dissemination, geographic location determination, random unit disc graphs, coverage and connectivity</i> • <i>Ad hoc network security: authentication techniques, physical layer attacks, security application protocols, routing security, broadcast security, secure location verification</i>
PUSTAKA UTAMA/ REFERENCES	• Michel Barbeau & Evangelos Kranakis, <u>Principles of Ad Hoc Networking</u>, Wiley, 2007. • Ian F. Akyildiz and Xudong Wang, <u>Wireless Mesh Networks</u>, Wiley, 2009. Artikel-artikel dari jurnal ilmiah: • IEEE Transaction on Communications • IEEE Transaction on Wireless Communication <i>Articles from technical journals.</i>

MATA KULIAH/ COURSE TITLE	TE091522: Jaringan Satelit TE091522: <i>Satellite Network</i> Credits: 2 Semester: Pilihan (<i>Elective</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami dasar-dasar sistem komunikasi satelit • Mahasiswa memahami prinsip kerja dan penerapan jaringan satelit. • <i>Student comprehends the fundamentals of satellite communication systems.</i> • <i>Student comprehends the principles and applications of satellite networks.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menentukan pengarahannya stasiun bumi. • Mahasiswa mampu merencanakan sistem komunikasi satelit. • Mahasiswa mampu merencanakan jaringan satelit. • Mahasiswa mampu menganalisis kinerja sistem dan jaringan komunikasi satelit. • <i>Student is able to determine pointing of earth station antennas</i> • <i>Student is able to design satellite communication system.</i> • <i>Student is able to design satellite networks.</i> • <i>Student is able to analyze the performance of satellit communication systems and networks.</i>
POKOK BAHASAN/ SUBJECTS	• Orbit satelit; pengarahannya stasiun bumi; • Teknologi satelit; ruas bumi dan ruas angkasa; • Aspek propagasi: antena, redaman lintasan; link budget: bumi-satelit, ISL; • Implikasi kondisi propagasi pada sistem komunikasi satelit: teknik modulasi, sistem akses jamak, kendali kesalahan; • Jaringan satelit seluler: satelit multibeam, interferensi untuk sistem TDMA dan CDMA, jaringan satelit LEO/MEO; • Jaringan satelit pita lebar: masalah-masalah dalam penerapan jaringan ATM dan IP dengan satelit; jaringan satelit pita lebar berbasis ATM; kapasitas jaringan satelit pita lebar; • Jaringan VSAT. • <i>Satellite orbits; earth station antenna pointing.</i> • <i>Satellite technology; earth and space segments.</i> • <i>Propagation aspects: antennas, path losses; link budget: earth-satellite, ISL.</i> • <i>Implication of propagation conditions on the communication system: modulation techniques, multiple access, error control.</i>

	• <i>Cellular satellite network: multibeam satellite, interference in TDMA and CDMA, LEO/MEO satellite networks.</i> • <i>Broadband satellite networks: problems in applying ATM and IP network with satellites; broadband satellite network capacity.</i> • <i>VSAT networks.</i>
PUSTAKA UTAMA/ REFERENCES	• D. Roddy, "Satellite Communications", 3rd Ed., McGraw-Hill, 2001 • E. Lutz, M. Werner, A. Jahn, "Satellite Systems for Personal and Broadband Communications", Springer, 2000 • Tri T, Ha, "Digital Satellite Communications", 2nd Ed., McGraw-Hill, 1990 • G. Maral, M. Bousquet, "Satellite Communications Systems", 2nd Ed., John Wiley and Sons, 1993

MATA KULIAH/ COURSE TITLE	TE091523: Pengkodean Kanal TE091523: <i>Channel Coding</i> Credits: Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Untuk mempelajari berbagai teknik pengkodean kanal pada komunikasi digital beserta karakterisasi unjuk kerja masing-masing teknik. <i>To study various channel coding techniques for digital communication as well as their performance caharacterisations.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu memahami hal-hal berikut beserta menerapkan pada sistem komunikasi digital: • Batas-batas teoritik dan kapasitas yang berkaitan dengan sistem pengkodean kanal • Teknik-teknik pengkodean kanal modern • Analisa unjuk kerja berbagai teknik pada bermacam-macam jenis kanal <i>The students will understand the following topics as well as their applications in digital communication system:</i> • <i>Theoretical limits and capacities related with channel coding</i> • <i>Modern channel coding techniques</i> • <i>Performance analysis of channel coding techniques for various channel conditions</i>
POKOK BAHASAN/ SUBJECTS	• Dasar-dasar finite field, Galois field, polinomial dengan koefisien dari suatu field. • Konsep-konsep dasar teknik pengkodean kanal: Kode Hamming, persamaan cek paritas, batas Hamming, matriks pembangkit kode, representasi kode secara grafis; konstruksi trellis secara sistematis untuk kode blok. • Pengkodean Konvolusional: Trellis untuk deskripsi konvolusional, Pengkode Umpan balik, Sistematis dan Rekursif. Pendekodean Maximum Likelihood, Spektrum jarak. Algoritma APP, Log-APP dan implementasi biner. • Pengkodean Aljabar: Pendekatan aljabar untuk pengkodean kanal. Finite field dan kode pada Galois field. Persamaan koreksi

	kesalahan. Kode Reed-Solomon, pendekodean aljabar dasar, kode BCH, algoritma Berlekamp-Massey. • <i>Finite fields, Galois field, polynomial over fields.</i> • Fundamental Coding Concepts : <i>Hamming Codes, Parity Check Equations, Hamming Bound, Code Generator Matrices, Graphical Representations of Codes: Parity Check Trellis, Systematic Trellis Construction for Block Codes, Tail-biting trellises and the square root bound.</i> • Convolutional Coding: <i>Trellis of Convolutional Description, Algebraic Description, Feedback-, Systematic-, and Recursive Systematic Encoders. Maximum-Likelihood Decoding, The Union Bound, The Distance Spectrum, The A Posteriori Probability (APP) Algorithm, Log-APP, Max-Log APP and Binary Implementations.</i> • Algebraic Coding: <i>Algebraic Approaches to Error Control Coding, Finite Fields, Codes in the Light of Galois Fields, Error Correction and Error Correcting Equations. Reed-Solomon Codes, Basic Algebraic Decoding, BCH Codes, Fast Decoding, The Berlekamp-Massey Algorithm</i>
PUSTAKA UTAMA/ REFERENCES	• Todd K. Moon, <u>Error Correction Coding: Mathematical Methods and Algorithms</u>, Wiley, 2005. • Tom Richardson & Ruediger Urbanke, <u>Modern Coding Theory</u>, Cambridge University Press, 2008. Artikel-artikel dari jurnal ilmiah: • IEEE Transaction on Information Theory • IEEE Transaction on Communications <i>Articles from the above technical journals.</i>

MATA KULIAH/ COURSE TITLE	TE091524: Rangkaian Gelombang Mikro TE091524: <i>Microwave Circuit</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari komponen aktif dan pasif, rangkaian terpadu gelombang mikro serta teknologi mikrostrip dan teknik pengukuran parameter rangkaian gelombang mikro. <i>To study microwave passive, active and integrated circuits, as well as microstrip technology and measurement techniques for microwave circuits.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa memahami prinsip-prinsip dan komponen rangkaian gelombang mikro beserta teknik pengukuran yang terkait. <i>The students will understand the principles and components of microwave circuits, and also related measurement techniques.</i>
POKOK BAHASAN/ SUBJECTS	• Spektrum frekuensi; review teori tentang bumbung gelombang persegi, circular dan elliptical; • Sumber gelombang mikro: klystron, magnetron, Gunn diode; Penguat gelombang mikro: TWT, klystron, magnetron, LNA, parametric amplifier; mixer dan modulator: mixer, LNB, diode modulator, microwave integrated circuit; • Komponen pasif: attenuator, termination, short, joint, rotary joint, detector, transition, coupler, directional coupler, isolator, circulator, standing wave detector, sliding crew tuner, phase shifter, magic tee, splitter, combiner, horn, resonator, window, slotted line, filter dan YIG filter; • Teknologi microstrip: stripline, microstrip; teknik pengukuran: frekuensi dengan resonator, panjang gelombang, VSWR, return loss, coupling, impedansi, isolasi, matching impedance. • <i>Frequency spectrum; review on wave propagation in rectangular, circular and elliptical waveguide.</i> • <i>Microwave sources: klystron, magnetron, Gunn diode; microwave amplifier; mixer & modulator: mixer, LNB, diode modulator, microwave integrated circuit, transition, coupler, directional coupler, isolator, circulator, standing wave detector, sliding crew tuner, phase shifter, magic tee, splitter, combiner, horn, resonator, window, slotted line, filter and YIG filter;</i> • <i>Passive components: attenuator, termination, short, joint, rotary joint, detector,</i> • <i>Microstrip technology: stripline, microstrip, measurement techniques: frequency using resonator, wavelength, VSWR, return</i>

	<i>loss, coupling, impedance, isolation, matching impedance.</i>
PUSTAKA UTAMA/ REFERENCES	• R.E. Collin, <u>Foundations of Microwave Engineering</u>, 2nd ed., McGraw Hill, 1992. • J. Helszain, <u>Passive and Active Microwave Circuits</u>, Wiley, 1978. • K.C. Gupta & A. Singh, <u>Microwave Integrated Circuits</u>, Wiley, 1974. • K.C. Gupta, R. Garg & Bahl, <u>Microstrip Lines & Slotlines</u>, Artech, 1979.

MATA KULIAH/ COURSE TITLE	TE091525: Jaringan Akses TE091525: Access Networks Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari berbagai jenis jaringan telekomunikasi beserta berbagai teknik-teknik akses yang diperlukan. <i>To study various telecommunication networks and related access techniques</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu memahami prinsip dan operasi berbagai jenis jaringan telekomunikasi beserta teknik-teknik akses yang diperlukan. <i>The students will be able to understand principles and operation of different telecommunication networks and required access techniques</i>
POKOK BAHASAN/ SUBJECTS	• Multiplexing • Jaringan optik: FTTH, WDM-PON • Akses kabel pita lebar: xDSL, SLAM • Sinkronisasi • Akses jamak • Teknologi akses nirkabel • • <i>Multiplexing</i> • <i>Optical networks: FTTH, WDM-PON</i> • <i>Broadband cable: xDSL, SLAM</i> • <i>Synchronization</i> • <i>Multiple access</i> • <i>Wireless acces technologies</i>
PUSTAKA UTAMA/ REFERENCES	• Jan. A. Audestad, <u>Technologies and System for Access and Transport Networks</u>, Artech House, 2008. • M. Engels & F. Petré, <u>Broadband Fixed Wireless Access: A System Perspective</u>, Springer-Verlag, 2006. • Chinlon Lin, ed., <u>Broadband Optical Access Networks and Fiber-to-the-Home: Systems Technologies and Deployment</u>, Wiley, 2006. • Dee Denteneer, Johan S.H. van Leeuwaarden, <u>Multiaccess, Reservations and Queues</u>, Springer-Verlag, 2008.

MATA KULIAH/ COURSE TITLE	TE091526: Jaringan Manajemen Telekomunikasi TE091526: <i>Telecommunication Management Networks</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari elemen-elemen dan operasi jaringan telekomunikasi serta teknik-teknik manajemen terkait. <i>To study telecommunication network elements and operations, as well as related management techniques</i>
KOMPETENSI/ COMPETENCY	Mahasiswa mampu memahami operasi berbagai jenis jaringan telekomunikasi serta teknik-teknik manajemen yang diperlukan. <i>The students will be able to understand operational aspects of telecommunication networks and required management techniques.</i>
POKOK BAHASAN/ SUBJECTS	• Manajemen Jaringan Tradisional: fungsionalitas pada OSI, SNMP v1-3, MIB-I, MIB-II, RMON, RMON2 • Standar saat ini: Systems Management System (SMS), ARM, CIM, SLA factor • Alat pengukur jaringan; pemantauan aktif & pasif • Arsitektur jaringan nirkabel: GSM, GPRS & UMTS. Profil QoS & arsitektur layanan • Keamanan • <i>Traditional Network Management: OSI functional areas, SNMP v1-3, MIB-I, MIB-II, RMON, RMON2</i> • <i>Current standards: Systems Management System (SMS), ARM, CIM, SLA factor</i> • <i>Network Probes; active & passive monitoring</i> • <i>Wireless architectures: GSM, GPRS & UMTS. QoS profiles & service architectures</i> • <i>Security</i>
PUSTAKA UTAMA/ REFERENCES	• Peter Massam, "<u>Managing Service Level Quality: Across Wireless and Fixed Networks</u>," John Wiley & Sons, 2003. • Salah Aidarous & Thomas Plevyak, eds., "<u>Managing IP Networks: Challenges and Opportunities</u>," IEEE Press-Wiley, 2003. • Thomas A. Limoncelli, Christina J. Hogan & Strata R. Chalup, "<u>The Practice of System and Network Administration</u>," 2nd ed., Addison-Wesley, 2007.

MATA KULIAH/ COURSE TITLE	TE091527: Kualitas dan Keandalan Sistem Komunikasi TE091527: Communication System Quality & Reliability Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari berbagai metrik untuk mengukur kualitas sistem komunikasi dan metode-metode untuk mengevaluasi keandalan sistem. <i>To study metrics to measure communication system quality and methods to evaluate system reliability.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa akan mampu: • Memahami bermacam-macam QoS untuk berbagai jenis sistem komunikasi dan jenis content yang berbeda • Mengevaluasi keandalan suatu sistem komunikasi berdasarkan model dan kondisi tertentu <i>The students will be able to:</i> • <i>To understand various QoS for differennt communication systems and for different content</i> • <i>To evaluate reliability of a communication system based on a certain model in a given condition</i>
POKOK BAHASAN/ SUBJECTS	• Kesalahan dan kegagalan: model-model kesalahan • Konsep QoS • Metode-metode evaluasi dan teknik pengukuran • Aksesibilitas • Keandalan koneksi • Keandalan routing • <i>Faults & failures: error models</i> • <i>QoS concepts</i> • <i>Evaluation and measurement</i> • <i>Accessibility</i> • <i>Connection reliability</i> • <i>Routing reliability</i>
PUSTAKA UTAMA/ REFERENCES	• William C. Hardy, "<u>QoS Measurement and Evaluation of Telecommunications Quality of Service</u>," John Wiley & Sons, 2001. • Mostafa Abd-El-Barr, "Design and Analysis of Reliable and Fault-Tolerant Computer Systems," Imperial College Press, 2007.

MATA KULIAH/ COURSE TITLE	TE091528: Kompatibilitas Elektromagnetik TE091528: <i>Electromagnetic Compatibility</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Untuk menguasai kemampuan untuk menerapkan Kompatibilitas Elektromagnetik. <i>To acquire the capability for the application of Electromagnetic Compatibility</i>
KOMPETENSI/ COMPETENCY	Mahasiswa akan memperoleh: • Pengetahuan tentang EMC • Keterampilan di bidang EMC • Sikap terhadap EMC • Sifat-sifat pribadi dalam penerapan EMC <i>The students will acquire:</i> • <i>Knowledge, skills and attitude in awareness of Electromagnetic Compatibility</i>
POKOK BAHASAN/ SUBJECTS	• Konsep tentang EMC • Elektromagnetik Interference (EMI) • Coupling & Shielding • Grounding & Radiasi • Pengukuran & regulasi • <i>The concept of EMC, EMI, Coupling, shielding, grounding, radiation, measurements and regulation.</i>
PUSTAKA UTAMA/ REFERENCES	• Clayton R Paul, "<u>Introduction to Electromagnetic Compatibility</u>", John Wiley & Sons, Inc. 1992 • V Prasad Kodali, "<u>Engineering Electromagnetic Compatibility</u>," IEEE Press. 2001

MATA KULIAH/ COURSE TITLE	TE091529: Pengolahan Sinyal Adaptif TE091529: <i>Adaptive Signal Processing</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari model dan karakteristik urutan acak waktu diskrit dan berbagai struktur filter adaptif untuk pengolahan sinyal acak. <i>To study models of and characterization of discrete-time random signals and various adaptive filters to process random signals.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan: • Menguasai pengetahuan tentang pemodelan proses stokastik • Mengetahui bermacam-macam struktur filter adaptif dan karakteristiknya untuk mengolah urutan acak. <i>The students are expected:</i> • <i>To acquire knowledge for the modelling of stochastic process</i> • <i>To understand various structures of adaptive filtes and their characteristics to process random sequences</i>
POKOK BAHASAN/ SUBJECTS	• Urutan acak waktu diskrit, kestasioneran, matriks korelasi dan kerapatan daya spektral. • Filter Wiener, prinsip orthogonalitas, permukaan unjuk kerja kesalahan, prediksi linier, pemodelan autoregresif. • Filter adaptif LMS, metode LS, estimasi LS dan SVD. Filter RLS dan Kalman. • <i>Discrete-time random sequence, stationarity, correlation matrix and power spectral density</i> • <i>Wiener filters; othrogonality principles, error performance surface, linear prediction, autoregressive modelling</i> • <i>LMS adaptive filter, LS methods, LS and SVD estimation. RLS filter and Kalman filter</i>
PUSTAKA UTAMA/ REFERENCES	• Simon Haykin, <u>Adaptive Filter Theory</u>, 4th ed., Prentice Hall, 2002. • Ali H. Sayed, <u>Adaptive Filters</u>, John Wiley & Sons, 2008. Artikel-artikel dari jurnal ilmiah: • IEEE Trans. on Signal Processing • IEEE Trans. on Information Theory <i>Articles from technical journals.</i>

MATA KULIAH/ COURSE TITLE	TE091530: Analisa Content Multimedia TE091530: <i>Multimedia Content Analysis</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari teknik-teknik untuk mengekstraksi dan menganalisa content suatu sinyal multimedia: suara, citra dan video. <i>To study techniques to extract and to analyze the content of various multimedia signals: speech, image & video.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan: • Memahami dan mampu mengimplementasikan teknik-teknik analisa sinyal wicara dan musik. • Memahami dan mampu mengimplementasikan teknik-teknik analisa dan pengenalan obyek pada citra • Memahami dan mampu mengimplementasikan teknik-teknik dasar untuk analisa content dari video. <i>The students are expected:</i> • <i>To understand and to be able to implement techniques to analyze speech signal and music</i> • <i>To understand and to be able to implement techniques of content and object recognition in image</i> • <i>To understand and to be able to implement basic techniques of content analysis for video signals</i>
POKOK BAHASAN/ SUBJECTS	• Dekomposisi eigenvalue, PCA dan ICA. • Representasi waktu dan spektral dari sinyal wicara dan musik; pemisahan sinyal suara tercampur; pengenalan jenis kelamin pengucap; pemisahan suara musik berdasarkan instrumen dan vokal. • Pengenalan obyek pada citra: penghilangan derau dan restorasi pada citra; deteksi tepian; metode korelasi; Snake model dan metode level set. • Pengenalan obyek pada video; penjejukan obyek pada video; metode-metode probabilistik; karakterisasi pemandangan pada suatu urutan video. • <i>Eigenvalue decomposition, PCA and ICA.</i> • <i>Time and spectral representation of speech and music; signal separation; gender recognition of speaker; music separation into instruments and singing voice.</i> • <i>Object recognition in image: image denoising and restauration; edge detection; correlation method; Snake model and level set method.</i>

	• <i>Object recognition in video; object tracking in video; probabilistic models; scene characterization in video.</i>
PUSTAKA UTAMA/ REFERENCES	• Yihong Gong & Wei Xu, <u>Machine Learning for Multimedia Content Analysis</u>, Springer, 2007. • Wu Chou & Biing-Hwang Juang, eds., <u>Pattern Recognition in Speech and Language Processing</u>, CRC Press, 2003. • Yu-Jin Zhang, ed., <u>Advances in Image and Video Segmentation</u>, IRM Press, 2006. • Sagarmay Deb, ed., <u>Video Data Management and Information Retrieval</u>, IRM Press, 2005. • Yiannis Kompatsiaris & Paola Hobson, eds., <u>Semantic Multimedia and Ontologies: Theory & Applications</u>, Springer-Verlag, 2008.

MATA KULIAH/ COURSE TITLE	TE091531: Kriptografi dan Keamanan Multimedia TE091531: <i>Cryptography and Multimedia Security</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari permasalahan keamanan dalam transmisi dan distribusi sinyal-sinyal multimedia beserta teknik-teknik untuk meningkatkan keamanan. <i>To study various security problems in the trasmission and distribution of multimedia signals, as well as proposed techniques to implement security.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan: • Menguasai pengetahuan tentang permasalahan keamanan dalam representasi, transmisi dan distribusi sinyal-sinyal multimedia di jaringan, • Memahami teknik-teknik terkait yang digunakan, antara lain: cipher, enkripsi, steganografi dan digital watermarking, serta aplikasinya. <i>The students are expected:</i> • <i>To acquire knowledge related to security in the representation, transmission and distribution of multimedia signals over networks.</i> • <i>To understand related techniques, i.e.: cipher, encryption, steganography and digital watermarking, as well as their applications.</i>
POKOK BAHASAN/ SUBJECTS	• Model-model symmetric cipher, teknik substitusi, teknik transposisi struktur DES sederhana, prinsip block cipher, kekuatan DES dan prinsip desain DES, kriteria evaluasi AES, AES cipher, algoritma triple DES, Blowfish dan RC5, • Prinsip-prinsip public-key cryptosystem, algoritma RSA, manajemen kunci public, pertukaran kunci Diffie-Hellman, algoritma kurva eliptik, • Model watermarking berbasis komunikasi, berbasis geometrik dan pemodelan deteksi watermark dengan korelasi, prinsip watermarking dengan informasi sampling dan dalam konteks optimisasi, • Prinsip dirty paper code dan implementasi praktisnya: direct binning, quantization index modulation, dither modulation dan lattice code, jenis-jenis kesalahan: false positive dan false negative, kurva ROC. • <i>Symmetric cipher models, substitution techniques, transposition techniques, simple DES structure, principle of block cipher, DES strength and DES design, AES evalution criteria, AES cipher, triple</i>

	<i>DES algorithm, Blowfish and RC5,</i> • <i>Principles of public-key cryptosystem, RSA algorithms, public key management, Diffie-Hellman key exchange, elliptic curve algorithm.,</i> • <i>Communication based watermarking model, watermark detection modeling using correlation, principles of watermarking using side information</i> • <i>Dirty paper code and its practical implementation: direct binning, quantization index modulation, dither modulation and lattice code, types of errors: false positive and false negative, ROC curve.</i>
PUSTAKA UTAMA/ REFERENCES	• William Stallings, <u>Cryptography and Network Security</u>, 3rd ed., Prentice Hall, 2003. • Husrev T. Sencar, Mahalingam Ramkumar & Ali N. Akansu, <u>Data Hiding Fundamentals and Applications: Content Security in Digital Media</u>, Elsevier Academic Press, 2006. • Ingemar J. Cox, Matthew L. Miller, Jeffery A. Bloom, Jessica Fridrich & Ton Kalker, <u>Digital Watermarking and Steganography</u>, 2nd ed., Morgan Kauffman, 2008.

MATA KULIAH/ COURSE TITLE	TE091532: Jaringan Sensor Nirkabel TE091532: Wireless Sensor Networks Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari prinsip kerja komponen dan arsitektur jaringan sensor nirkabel (JSN), beserta berbagai protokol yang diperlukan untuk operasi JSN untuk bermacam-macam aplikasi. <i>To study principles, components and architectures of wireless sensor network (WSN), as well as required protocols for its operation for various applications.</i>
KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan: • Menguasai pengetahuan tentang arsitektur dan komponen-komponen JSN beserta karakteristiknya. • Memahami permasalahan-permasalahan pada JSN, antara lain: distribusi dan deteksi terdistribusi, desain protocol untuk routing dan koleksi data yang hemat energi. <i>The students are expected:</i> • <i>To acquire knowledge about architectures and components of WSN and their important characteristics.</i> • <i>To understand problems and related solutions in WSN, e.g.: distributed detection and estimation, protocols design for energy efficient routing and data collection.</i>
POKOK BAHASAN/ SUBJECTS	• Perangkat pemancar dan penerima nirkabel untuk JSN, karakteristik kanal nirkabel. • Arsitektur JSN, protokol MAC, protokol kontrol kesalahan, dasar pengalamatan dan manajemen alamat; sinkronisasi waktu; • Teknik-teknik routing: forwarding; gossiping, flooding, single hop dan multihop, coverage dan deployment. • Implementasi JSN pada MICAz dan simulasi dengan NS2 dan Tossim. • <i>Wireless transmitters and receivers for WSN; wireless channel characteristics.</i> • <i>WSN architectures, MAC protocols, error control protocols, addressing and address management; time synchronization.</i> • <i>Routing techniques: forwarding, gossiping, flooding, single hop and multihop, coverage and deployment.</i> • <i>WSN implementation using MicaZ and simulation based on ns2 and Tossim</i>
PUSTAKA UTAMA/	• Holger Karl & Andreas Willig, <u>Protocols and Architectures for Wireless Sensor Networks</u>, John Wiley & Sons, 2005. • Shashi Phoha, Thomas La Porta, & Christopher Griffin, eds., <u>Sensor</u>

REFERENCES

Network Operations, John Wiley & Sons/IEEE, 2006.

MATA KULIAH/ COURSE TITLE	TE091533: Sistem Komunikasi Nirkabel Lanjut TE091533: <i>Advanced Wireless Comm. System</i> Credits: 2 Semester: Pilihan (<i>Elective</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami prinsip kerja dan analisis kinerja teknologi-teknologi terbaru dalam sistem dan jaringan komunikasi nirkabel dan bergerak. • <i>Student comprehends the principles and performance evaluation of new technologies in wireless and mobile communication systems and networks.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa kinerja sistem komunikasi adaptif. • Mahasiswa mampu menganalisa kinerja sistem komunikasi dengan deteksi pengguna jamak. • Mahasiswa mampu menganalisa dan merencanakan sistem komunikasi multi-carrier. • Mahasiswa mampu menganalisa sistem komunikasi multi-antena. • Mahasiswa mampu menganalisa jaringan ad-hoc dan sistem komunikasi kooperatif. • Mahasiswa mampu menganalisa next generation networks. • <i>Student is able to analyze the performance of adaptive communications.</i> • <i>Student is able to analyze the performance of communication systems with multi-user detection.</i> • <i>Student is able to analyze and design multi-carrier communication systems.</i> • <i>Student is able to analyze multi-antenna communication systems.</i> • <i>Student is able to analyze ad-hoc networks and cooperative communication systems.</i> • <i>Student is able to analyze next generation networks.</i>
POKOK BAHASAN/ SUBJECTS	• Review dasar-dasar sistem dan jaringan komunikasi nirkabel dan bergerak. • Adaptasi terhadap kanal yang berubah terhadap waktu. • Deteksi pengguna jamak. • Komunikasi multi-carrier: OFDM, MC-CDMA. • Komunikasi multi-antena: diversity, BLAST, space-time coding. • Jaringan ad-hoc dan komunikasi kooperatif. • Next generation networks.

	• <i>Review of fundamentals of wireless and mobile communication systems and networks.</i> • <i>Adaptation to time-varying channels.</i> • <i>Multi-user detection.</i> • <i>Multi-carrier communications.</i> • <i>Multi-antenna communications: diversity, BLAST, space-time coding.</i> • <i>Ad-hoc networks and cooperative communications.</i> • <i>Next generation networks.</i>
PUSTAKA UTAMA/ REFERENCES	• K. Pahlavan, A.H. Levesque, "<u>Wireless Information Networks</u>", 2nd ed., John Wiley and Sons, 2005. • D. Tse, P. Viswanath, "<u>Fundamentals of Wireless Communications</u>", Cambridge University Press, 2005. • A. Goldsmith, "<u>Wireless Communications</u>", Cambridge University Press, 2005. • S. Haykin, M. Moher, "<u>Modern Wireless Communications</u>", Prentice-Hall, 2005. • IEEE journals.

MATA KULIAH/ COURSE TITLE	TE091534: Sistem Komunikasi Gelombang Mikro TE091534: <i>Microwave Communication System</i> Credits: 2 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mempelajari prinsip-prinsip dari sistem komunikasi gelombang mikro, karakteristik dan faktor-faktor penting yang berpengaruh terhadap unjuk kerja sistem <i>To study main principles of microwave communication system, its characteristics and important factors which affect its performance.</i>
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KOMPETENSI/ COMPETENCY	Mahasiswa diharapkan mampu: • Memahami karakteristik utama dan faktor-faktor yang berpengaruh pada sistem komunikasi gelombang mikro • Memahami mekanisme dan pemodelan perambatan gelombang mikro pada berbagai kondisi lingkungan dan jenis sel • Mendesain sistem komunikasi gelombang mikro <i>The students are expected to be able:</i> • <i>To understand main characteristics of and factors which have influents on microwave communication system</i> • <i>To understand microwave propagation mechanism and modeling over various terrain and different type of cells</i> • <i>To design microwave communication system</i>
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POKOK BAHASAN/ SUBJECTS	• Derau dan distorsi pada sistem gelombang mikro • Mekanisme & model-model perambatan gelombang elektromagnetik: refleksi, refraksi, scattering, difraksi, path loss, free space loss, link budget • Antena: medan dekat dan medan jauh; parameter antena: pola radiasi, direktivitas, power gain, beamwidth, efisiensi; dipole, antena larik, antena horn • Terrestrial fixed link: karakterisasi permukaan, kondisi LOS dan NLOS, pengaruh gedung terhadap kanal propagasi, propagasi di daerah rural, propagasi di daerah urban • Macrocell: path loss models (Okumua-Hata, COST 231-Hata, dll); model fisik (Allsebrook & Parsons, Ikegami, rooftop), ITU-R • Shadowing: karakterisasi fisik, pengaruh terhadap coverage, correlated shadowing • Narrowband & wideband fast fading: kanal narrowband fading, distribusi Nakagami-m, statistik orde dua: efek Doppler; model kanal wideband fading, fungsi Bello, • Microcell dan picocell: model-model empiris, model LOS, model NLOS, model perambatan fisik di dalam gedung • Teknik-teknik berbasis diversity untuk mengatasi fading
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	• <i>Noise and distortion in microwave systems</i> • <i>Mechanisms and models of propagation: reflection, refraction, scattering, diffraction, path loss, free space loss, link budget</i> • <i>Antenna: near- and far-field, antenna parameters: radiation pattern, directivity, power gain, beamwidth, efficiency; dipole, array antenna, horn</i> • <i>Terrestrial fixed link: terrain characterisation, LOS and NLOS conditions, effect of a building on the radio propagation channel, propagation in rural area, propagation in urban area</i> • <i>Macrocell: path loss models (Okumua-Hata, COST 231-Hata, dll); physical model (Allsebrook & Parsons, Ikegami, rooftop), ITU-R</i> • <i>Shadowing: physical characterization, effects on coverage, correlated shadowing</i> • <i>Narrowband & wideband fast fading: narrowband fading channel, Nakagami-m distribution, second order statistics; Doppler effect; wideband fading channel model, Bello function,</i> • <i>Microcell and picocell: empirical models, LOS model, NLOS model, indoor physical propagation model</i> • <i>Diversity techniques to combat fading</i>
PUSTAKA UTAMA/ REFERENCES	• Simon R. Saunders & Alejandro Aragon-Zavallo, <u>Antennas and Propagation for Wireless Communication Systems</u>, 2nd ed., Wiley, 2007. • Nathan Blaunsten & Christos G. Christodoulou, <u>Radio Propagation and Adaptive Antennas for Wireless Communication Links: Terrestrial, Atmospheric, and Ionospheric</u>, Wiley, 2007. • David M. Pozar, <u>Microwave and RF Design of Wireless Systems</u>, Wiley, 2001.

MATA KULIAH/ COURSE TITLE	TE091535: Topik Khusus Telekomunikasi Multimedia TE091535: <i>Special Topics in Multimedia Telecommunication</i> Credits: 2 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Untuk mempelajari topik-topik lanjut sesuai dengan perkembangan keilmuan telekomunikasi multimedia, misal: sistem komunikasi antena jamak, sistem komunikasi kooperatif, pengkodean jaringan, compressive sensing, pengkodean terdistribusi dll. <i>To study advanced topics related with multimedia communications, such as: multiantenna communication system, cooperative communication systems, network coding, compressive sensing, distributed coding etc.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa diharapkan memahami permasalahan-permasalahan yang aktual di dunia telekomunikasi multimedia beserta teknik-teknik terkait. • <i>The students are expected to understand recent problems and technical challenges in the field of multimedia telecommunications and related techniques.</i>
POKOK BAHASAN/ SUBJECTS	• Disesuaikan dengan topik yang ditawarkan pada semester tersebut. • <i>Adapted to the offered topics of a given semester.</i>
PUSTAKA UTAMA/ REFERENCES	• Buku-buku teks terkait. Jurnal-jurnal ilmiah: • IEEE Trans. on Communication • IEEE J. On Selected Areas on Communications • IEEE Trans. on Wireless Communications • IEEE Trans. on Signal Processing • IEEE Trans. on Information Theory • <i>Textbooks of related topics.</i> • <i>Article s from above technical journals.</i>

SILABUS KURIKULUM/COURSE SYLLABUS

MATA KULIAH/ COURSE TITLE	TE091441: Teknik Akuisisi Data TE091441: <i>Data Acquisition Technique</i> Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami dan mampu merealisasikan sistem pengkondisi sinyal analog yang berasal dari output transduser, memahami dan mampu merealisasikan sistem konversi sinyal analog ke digital (ADC) dan pemrosesan serta komunikasi data digital hasil konversi tersebut dengan program komputer. <i>To have understanding of methods of and to have ability in: realizing analog signal conditioning system, realizing analog to digital conversion system, signal processing and communication system.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami teknik pengkondisian sinyal output transduser dan mampu merealisasikan sistem pengkondisian untuk berbagai jenis sinyal • Mahasiswa memahami berbagai metode dalam analog to digital conversion (ADC), mengetahui komponen-komponen ADC dan mampu menerapkannya dalam praktek akuisisi data. • Mahasiswa memahami dan mampu merealisasikan teknik pemrosesan sinyal digital untuk meningkatkan kualitas sinyal, dan mengkomunikasi sinyal tersebut dalam sistem terdistribusi. <i>To have understanding of various analog signal condition techniques.</i> <i>To have understanding of various methods in analog to digital conversion (ADC), ADC components, and to have ability to apply the understanding in practical use.</i> <i>To have understanding of digital signal processing techniques and to have a capability in realizing them for enhancing signal quality, and to communicate the signals in a distributed system.</i>
POKOK BAHASAN/	• Transduser dan karakteristiknya, pengkondisian sinyal kecil, isolasi, analog filtering, sampling, ADC, DAC, pemrograman ADC dan DAC, disain filter digital, sistem komunikasi data serial, penugasan rancangan sistem akuisisi data.

SUBJECTS	• <i>Transducers, small signal conditioning, isolations, analog filtering, sampling, ADC, DAC, programming techniques to drive ADC and DAC, designs of digital filter, serial data communication system, assignment of data acquisition system design</i>
PUSTAKA UTAMA/REFERENCES	• Joseph J Carr, <u>Sensor and Circuits</u>, Prentice Hall Inc., 1993. • <u>Instrumentation Amplifier Application Guide</u>, Charles Kitchin and Lew Counts, Analog Device, 1992. • <u>Data Acquisition Handbook</u>, Analog Device. • <u>Data Acquisition Data Book</u>, Nat Inst. • <u>Digital Signal Analysis</u>, Samuel D Stearns and Don R Hush, Prentice Hall Inc, 1990.

MATA KULIAH/ COURSE TITLE	TE091443: Sensor dan Aktuator TE091443: <i>Sensor and Actuator</i> Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami konsep dasar desain, menganalisa sistem dan aplikasi sensor-transduser dan aktuator. <i>to understand the basic concepts of design, analysis and application of sensor systems, transducers & actuators</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami konsep dasar desain sensor melalui pendekatan fenomena dan analogi bahan sensor, • Mahasiswa mampu memahami konsep dasar desain transduser melalui pendekatan fenomena dan analogi bahan transduser, • Mahasiswa mampu membuat prototype transduser sederhana dari bahan sensor yang bersifat Resistif(R), Induktif(L) dan Kapasitif(C), • Mahasiswa mampu memahami konsep dasar aktuator. • Mahasiswa mampu merencanakan dengan tepat sistim sensor dan aktuator pada berbagai bidang aplikasi. • <i>Students are able to understand the basic concepts of sensor design approach and the analogy phenomena sensor materials,</i> • <i>Students are able to understand the basic concept of transducer design through analogy approach and the phenomenon of the transducer material,</i> • <i>Students are able to make a simple prototype of the transducer material is a resistive sensor (R), Inductive (L) and capacitive (C),</i> • <i>Students are able to understand the basic concept of the actuator,</i> • <i>Students are able to plan properly the sensor and actuator systems in various fields of application.</i> •
POKOK BAHASAN/ SUBJECTS	• Definisi transduser, sensor, aktuator, probe, dan elektroda • Metode pengukuran langsung, tidak langsung, dan infrensial • Konsep desain sensor & transduser aktif; Desain sensor dan transduser aktif dari bahan sensor resistif, induktif, dan kapasitif • Desain sensor, transduser dan system alat ukur level ketinggian, temperature, kelembaban, angular, akselerasi, dan inclinometer • Tugas desain sensor dan transduser • Aktuator elektrik dan mekanik • Prinsip dasar perambatan gelombang akustik pada medium gas,

	cair, padat 2 medium yang berbeda, dan pada 3 medium yang berbeda; Desain alat aplikasi gelombang ultrasonik untuk pengukuran jarak, kepadatan benda, level ketinggian, dan <i>flowmeter</i> zat cair • Sistem pemantauan hidroklimatologi; Sistem telemetering DAM (SISTELDAM). • <i>Definition of transducers, sensors, actuators, probes, and electrodes; method of direct measurement, indirect, and infrensal; concept design active sensors & transducers; Design of active sensors and transducers of the sensor material resistive, inductive, and capacitive; Design sensors, transducers and systems level meter altitude, temperature, humidity, angular, acceleration, and inclinometer; Duty sensor and transducer design; electrical and mechanical actuators; principle of acoustic wave propagation in the medium of gas, liquid, solid 2 different medium, and at 3 different medium ; Design ultrasound application device for measuring distances, the density of objects, level of altitude, and the liquid flowmeter; hidroklimatologi monitoring system; telemetering system DAM (SISTELDAM).</i>
PUSTAKA UTAMA/ REFERENCES	• Joseph J.Carr, <u>Sensor and Circuits: Sensors, Transducers, and Suporting Circuits for Electronic Instrumentation, Measurement and Control</u>, New Jersey, T R Prentice Hall, Englewood Cliffs, 1993 • R C Asher, <u>Ultrasonic Sensors: Ultrasonic Sensors for Chemical and Process Plant</u>, IOP Publishing Ltd., 1997 • L E Kinsler, <u>Fundamental of Acoustics, Second Edition</u>, Wiley Eastern Limited, John Wiley & Sons, Inc New York, Chichester, Brisbance and Toronto © 1950, 1962. • Frederick W. Kremkau, <u>Diagnostic Ultrasound: Principles, Instrumentation, and Exercises</u>, Second Edition, Grune & Stration, Inc. © 1984 • Barry E Jones, <u>Instrumentation Measurement and Feedback</u>, TMH Edition, McGraw-Hill Book Company (UK) Limited, © 1978. • Bela G.Liptak, Kriszta Venczel, <u>Process Measurement: Instrument Engineers Handbook</u>, Revised Edition, Bela G, Liptak © 1969.

MATA KULIAH/ COURSE TITLE	TE091445: Rangkaian Pulsa TE091445: Pulse Circuit Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami permasalahan dalam disain rangkaian dengan input pulsa serta prosedur perancangan rangkaian dengan input pulsa
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat membaca dan memahami datasheet (electrical characteristic) dari komponen pasif dan aktif seperti resistor, kapasitor, dioda, transistor, Op Amp dan IC digital • Mahasiswa dapat menggunakan komponen pasif dan aktif seperti resistor, kapasitor, dioda, transistor, Op Amp dan IC digital secara praktis (tidak ideal) • Mahasiswa dapat melakukan perancangan untuk gabungan sistem analog dan digital
POKOK BAHASAN/ SUBJECTS	• Bentuk gelombang: Tipe gelombang, Karakteristik gelombang pulsa, Harmonisa gelombang • Rangkaian RC: Operasi Rangkaian RC, Persamaan Rangkaian RC, Respon Rangkaian RS terhadap gelombang kotak, Rangkaian Integrator, Rangkaian Differensiator, Efek pembebanan pada rangkaian integrator dan differensiator • Diode Switching: Diode sebagai switching, Diode zener, Rangkaian clipper, Rangkaian clamper, Rangkaian pengali tegangan • Transistor switching: Transistor ideal sebagai switch, Transistor praktis sebagai switch, Pewaktuan transistor switch, Memperbaiki pewaktuan transistor switch, Switch dengan JFET, Switch dengan MOSFET, Switch dengan CMOS • Rangkaian Inverter dan IC differensiator: Direct Coupled Bipolar Transistor Inverter, Capacitor Coupled Inverter, Rangkaian Inverter JFET, Inverter dengan IC Op Amp, Op Amp Differensiator • Rangkaian Schmitt Trigger dan Komparator Tegangan: Operasi rangkaian Schmitt Trigger, Disain dengan Upper Trigger Point, Disain dengan Upper dan Lower Trigger Point, Pemilihan kapasitor speed up, Karakteristik Input Output, Op Amp sebagai Schmitt Trigger, Rangkaian IC Schmitt Trigger, IC Voltage Comparator • Generator Ramp dan Integrator: Generator Ramp RC, Constant Current Ramp Generator, Osilator Relaksasi UJT, Osilator Relaksasi Diode 4 layer, Osilator Relaksasi UJT yang dapat diprogram, Transistor Bootstrap Ramp Generator, IC Bootstrap Ramp

	Generator, Free Running Ramp Generator, Rangkaian Miller Integrator, Generator Triangular • Monostable dan Astable Multivibrator dan IC Timer 555 : Bistable Multivibrator, Logic Gate • Sampling gate: Pencacah digital, Frekuensi Meter Digital dan Voltmeter Digital, Pulse Modulation dan Multipleksing
PUSTAKA UTAMA/ REFERENCES	• David A.Bell, <u>Solid State Pulse Circuit</u>, • Texas Instrument, National Instrument, Analog Device, Motorola Instrument dll.

MATA KULIAH/ COURSE TITLE	TE091447: Perancangan Sistem Elektronik Analog TE091447: <i>Design of Analog Electronic System</i> Credits: 4 Semester: V
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami secara mendalam tentang pentingnya komponen dan rangkaian elektronika analog serta aplikasi komponen dan rangkaian analog dalam sistim elektronika. <i>Learning to implementation of analog components and circuits into the electronic systems.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu merancang sistim elektronika analog • Mahasiswa mampu merealisasikan rancangan tersebut • <i>Students are able to design the analog electronic systems</i> • <i>Students are able to realize the design of analog electronic systems</i>
POKOK BAHASAN/ SUBJECTS	• Op-amp ideal: comparator, summing amplifier, integrator, diferensial, converter dan aplikasi rangkaian op amp. Filter aktif: karakteristik respon, Low-pass filter, High-pass filter, Band-pass filter, Band-stop filter, pengukuran respon dan aplikasinya • Osilator dan timer: osilator, feedback, sinusoidal, relaksasi, Timer 555, one-shot dan aplikasinya. • Voltage regulator: Seri-shunt, switching regulator, IC voltage regulator dan aplikasinya. Amplifier penggunaan khusus: Instrumentation, Isolation, OTA, Log dan Antilog amplifier dan aplikasinya • Rangkaian Elektronika untuk komunikasi: Linear amplifier, AM, FM, PLL dan aplikasinya • Rangkaian konversi data: Analog switch, S/H, ADC, DAC, V/F dan F/V Converter dan aplikasinya • Rangkaian pengukuran dan control: RMS to DC, Angle measurement, temperature, strain, pressure dan motion measurement, power control circuit dan aplikasinya • Pengantar SPICE dan Field Programmable Analog Array (FPAA), Praktikum Rangkaian Elektronika Analog. • <i>Op-amp circuits: amplifier, integrator, differential, converter, filter, isolation, log and anti-log amplifier and oscillator circuits.</i> • <i>Communication electronic circuits: Linear amplifier, amplitude and frequency modulation circuits.</i> • <i>Measurement and control electronic circuits: RMS to DC, sensor and power control circuits</i>

	• <i>Introduction to SPICE and Field Programmable Analog Array (FPAA)</i> • <i>Analog electronic circuit Laboratory</i>
PUSTAKA UTAMA/ REFERENCES	• Thomas L Floyd and David Bucha, <u>Fundamentals of Analog Circuit</u>, Prentice-Hall, 2002. • M Jacob, <u>Application and Design with Analog IC</u>, Prentice-Hall, 1993.

MATA KULIAH/ COURSE TITLE	TE091450: Divais Semikonduktor & Rangk. Terpadu TE091450: ICs and Semiconductor Devices Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami teori divais semikonduktor dan konsep dasar perancangan rangkaian terpadu. <i>Students can understand about semiconductor devices theory and concept of basic integrated circuit design</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami secara mandiri sifat divais semikonduktor. • Mahasiswa mampu merencanakan dengan tepat sistim rangkaian terpadu. • <i>Students can understand by self about semiconductor devices</i> • <i>Students can design integrated circuit systems exactly</i>
POKOK BAHASAN/ SUBJECTS	• Pita Energi dan konsentrasi pembawa meliputi bahan semikonduktor, struktur kristal, ikatan valensi, pita energi, kepadatan keadaan, konsentrasi pembawa intrinsic, donor dan akseptor • Fenomena perpindahan pembawa yang meliputi hanyutan pembawa, diffusi pembawa, injeksi pembawa • Persambungan p-n yang meliputi kondisi suhu equilibrium, daerah deplesi, kapasitansi deplesi, karakteristik arus-tegangan, kelakuan transient dan penyimpanan muatan, daerah patah persambungan • Divais bipolar yang meliputi aksi transistor, karakteristik statis transistor bipolar, tanggapan frekuensi, transistor bipolar sebagai saklar, transistor bipolar heterojunction, thyristor • Divais unipolar yang meliputi hubungan semikonduktor dan metal, JFET, MESFET, MOS diode, MOSFET • Divais Microwave yang meliputi Dioda Tunnel, Dioda IMPATT, Dioda BARITT • Divais Photonic yang meliputi Transisi radiativ dan absorpsi optical, LED, Semikonduktor laser, photodetector, solar cell • Diffusi dan Implantasi ion yang meliputi teori dasar diffusi, diffusi ekstrinsik, proses yang berhubungan dengan diffusi, distribusi dan range implantasi ion, proses yang berhubungan dengan implantasi ion • Teknologi mikroelektronika layout dan design rule, teknik fabrikasi MOS, karakteristik rangkaian, beberapa teknik rangkaian: statis dan dinamis

	• Tools untuk perancangan IC: Microwind, perancangan sub-system dan perancangan sistem terstruktur. • <i>Energy bands and carrier concentration that content of semiconductor materials, crystal structure, valence bonds, energy bands, state density, intrinsic carrier concentration, donors and acceptors.</i> • <i>Carrier transport phenomena that content of carrier drift, carrier diffusion, carrier injection.</i> • <i>p-n junction that content of thermal equilibrium condition, depletion region, depletion capacitance, current-voltage characteristics, charge storage and transient behavior, junction breakdown.</i> • <i>Bipolar devices that content of transistor action, static characteristic of bipolar transistors, frequency response and switching of bipolar transistors, heterojunction bipolar transistors, the thyristor.</i> • <i>Unipolar devices that content of metal-semiconductor contacts, JFET, MESFET, MOS diode, MOSFET.</i> • <i>Microwave devices that content of tunnel diode, IMPATT diode, BARITT diode.</i> • <i>Photonic devices that content of radiative transitions and optical absorption, LED, semiconductor laser, photo detector, solar cell</i> • <i>Diffusion and Ion Implantation that content of basic diffusion theory, extrinsic diffusion, diffusion-related processes, distribution and range of implanted ions, implantation-related processes.</i> • <i>Technology of microelectronic layout and rule design that content of MOS fabrication engineering, circuit characteristics, some of circuit engineering:static and dynamic.</i> • <i>Tools for IC design that content of microwind, sub-system design and structure systems design.</i>
PUSTAKA UTAMA/ REFERENCES	• S.M. Sze, <u>Semiconductor Devices Physics and Technology</u>, John Wiley & Sons, 1985. • Douglas A. Pucknell, Kamran Eshragian, <u>Basic VLSI Design</u>, System and Circuits, Prentice Hall, New Delhi, 1989. • Neil H. Waste, Kamran Eshragian, <u>Principles of VLSI Design- A System Perspective</u>, Addison-Wesley New York, 1989. • R.L. Geiger, P.E. Allen, N.R. Strader, <u>VLSI Design Technique for Analog and Digital Circuit</u>, McGraw-Hill, 1990.

MATA KULIAH/ COURSE TITLE	TE091451: Sistem Mikroprosesor & Mikrokontroler TE091451: <i>Microprocessor & Microcontroller Sys.</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami permasalahan dalam sistem mikrokontroler dan implementasinya dengan menggunakan komponen H/W programmable. • Mahasiswa memahami prosedur perancangan sistem mikrokontroler menggunakan komponen H/W programmable. • Mahasiswa dapat menggunakan tools (Assembly, CodeVision atau yang lainnya) untuk perancangan sistem mikrokontroler menggunakan komponen H/W programmable
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menggunakan komponen digital penunjang seperti gerbang dasar, buffer, Flip Flop, Register, Decoder, Encoder, Multiplexer dll untuk implementasi sistem mikrokontroler. • Mahasiswa dapat melakukan perancangan sistem mikrokontroler berbasis pemrograman dengan metode perancangan yang benar serta menggunakan tools assembly, Codevision atau yang lainnya dengan benar. • Mahasiswa menguasai bahasa pemrograman assembly atau yang lainnya dan dapat menggunakannya dengan baik dan benar.
POKOK BAHASAN/ SUBJECTS	• Konsep dasar Mikrokontroler : Struktur Mikrokontroler, Cara kerja Mikrokontroler, Keluarga Mikrokontroler MCS 51, Gambaran Umum • Arsitektur Mikrokontroler: Diagram blok MCS 51, Fungsi kaki-kaki MCS 51, Organisasi Memori : Program Memori, Data Memori, Register Mikrokontroler MCS 51 • Port I/O Mikrokontroler :, Port I/O parallel, Pembacaan dan penulisan port parallel, Port I/O serial,, Pembacaan dan penulisan port serial, Pengaturan baud rate, Komunikasi dengan banyak prosesor • Timer/Counter dan Aplikasinya: Mode Operasi, Tentang Timer 2, Instruksi-instruksi • Logika Pemrograman: Kelompok instruksi, Instruksi transfer data, Instruksi aritmatika, Instruksi logika, Instruksi Percabangan • Aplikasi : Aplikasi Tampilan Deret LED, Aplikasi Tampilan 7 segmen, Aplikasi Tampilan dengan LCD, Aplikasi Input DIPSWITCH dengan tampilan deret LED, Aplikasi Input DIPSWITCH dengan tampilan 7 segmen, Aplikasi Input DIPSWITCH dengan tampilan LCD, Aplikasi Input Keypad dengan tampilan deret LED, Aplikasi Input Keypad

	dengan tampilan 7 segmen, Aplikasi Input Keypad dengan tampilan LCD,. Aplikasi Multiplexer dan ADC dengan tampilan deret LED, Aplikasi Multiplexer dan ADC dengan tampilan 7 segmen, Aplikasi Multiplexer dan ADC dengan tampilan LCD, Aplikasi ADC dan LCD dan Serial RS232.
PUSTAKA UTAMA/ REFERENCES	• Rachmad Setiawan, <u>Mikrokontroler MCS51</u>, Graha Ilmu 2006 • Kenneth J Ayala, <u>The 8051 Microcontroller, Architecture, Programming and Applications</u>, West publishing Company, 1991 • Texas Instrument, National Instrument, <u>Analog Device</u>, Motorola Intrument dll.

MATA KULIAH/ COURSE TITLE	TE091452: Perancangan Komponen Terprogram TE091452: <i>Design of Programmable Device</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Mahasiswa memahami permasalahan dalam sistem digital dan implementasinya menggunakan komponen H/W programmable. • Mahasiswa memahami prosedur perancangan sistem digital menggunakan komponen H/W programmable. • Mahasiswa dapat menggunakan tools EDA untuk perancangan sistem digital menggunakan komponen H/W programmable.
KOMPETENSI/ COMPETENCY	• Mahasiswa dapat menggunakan komponen hardware (H/W) programmable seperti PLD (programmable logic device) dan FPGA (field programmable gate array) untuk implementasi sistem digital. • Mahasiswa dapat melakukan perancangan sistem digital berbasis H/W programmable dengan metode perancangan yang benar serta menggunakan tools EDA (Electronic Design Automation) dengan benar. • Mahasiswa menguasai bahasa VHDL dan dapat menggunakannya dengan baik dan benar.
POKOK BAHASAN/ SUBJECTS	• Overview Sistem Digital: Rangkaian kombinasional dan sekuensial, Kontroler dan data path, Finite State Machine (FSM). • Sejarah dan evolusi H/W programmable: PROM, PAL, PLA, Masked gate Array, FPGA. • Arsitektur H/W programmable: Blok logika, clock, I/O, interconnect, programmable switch, Blok-blok khusus, Emulating dan Prototyping. • Metodologi perancangan H/W programmable: Spesifikasi, Pemilihan komponen, perancangan, Verifikasi, Integrasi sistem, test. • Desain teknik H/W programmable: Hardware Description Language (HDL), Top down design, One hot encoding, Design for Test, Built in self test (BIST), Signature analysis. • Verifikasi: Simulasi, timing analysis, Vormal verification. • Tools EDA: Test bench, sintesa, place and route, programming tools. • Studi Kasus: skimming book reviews skimming jurnal or articles.
PUSTAKA UTAMA/ REFERENCES	• Totok Mujiono, <u>Hand Out Mata Kuliah PKT</u>, • Bob Zeidman, <u>Designing with FPGAs and CPLDs</u>, Elsevier, 2002 • Kevin Skahill, <u>VHDL for Programmable Logic</u>, Addison Wesley, 1996.

MATA KULIAH/ COURSE TITLE	TE091453: Dasar Sistem Elektronika Cerdas TE091453: <i>Fundamentals of Intelligent Electronic System.</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami prinsip-prinsip dasar dari komponen-komponen dalam sistem cerdas dan mampu mendisain sistem elektronika cerdas untuk aplikasi tertentu. <i>To have an understanding of basic principles of components of intelligent systems, and to have a capability of designing a certain application of the intelligent electronic system.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami prinsip-prinsip dan algoritma-algoritma dalam artificial neural network (ANN) dan dapat menganalisis performansi dan dapat membangun program komputer untuk merealisasikan sistem cerdas dengan ANN. • Mahasiswa memahami cara kerja semua subsistem dalam sistem fuzzy dan mampu merealisasikan sebuah sistem fuzzy untuk aplikasi clustering dan kontrol. • Mahasiswa memahami cara kerja evolutionary computation dan mampu merealisasikan untuk aplikasi optimasi. • <i>To have an understanding of basic principles and algorithms of artificial neural network (ANN), and to have a capability of performance analysis, developing computer program in realizing an ANN based intelligent system.</i> • <i>To have an understanding of mechanisms of all subsystems in fuzzy system, and to have a capability in realizing fuzzy system for data clustering and control applications.</i> • <i>To have understanding of mechanisms of evolutionary computation, and to have a capability in realizing the evolutionary computation for optimization problems.</i> •
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem elektronika cerdas, dasar-dasar neuroscience dan pemodelan neuron, model neural network feedforward & feedback, methoda pembelajaran neural network, competitive network, sistem logika fuzzy, fuzzy inference sistem, fuzzy clustering & control, evolutionary algorithm, genetic programming, aplikasi sistem elektronika cerdas.

	<i>Concepts of intelligent systems, basic neuroscience and neuron models, feedforward & recurrent neural networks, learning methods, competitive networks, neural network applications, fuzzy system, fuzzy inference system, fuzzy clustering & control, evolutionary algorithm, genetic programming, applications of intelligent systems.</i>
PUSTAKA UTAMA/ REFERENCES	• Fredric M Hum, Ivica Kostanic, <u>Principles of Neurocomputing for Science & Engineering</u>, McGraw-Hill Inc., 2001 • JSR Jang, CT Tsun, E. Mizutani, <u>Neuro-Fuzzy and Soft Computing</u>, Prentice Hall Inc., 1997. • NK Bose and P. Liang, <u>Neural Network Fundamental</u>, McGraw Hill, 1996. • David B Fogel, <u>Evolutionary Computation</u>, IEEE Press. • Hua Li, M Gupta (Eds), <u>Fuzzy Logic and Intelligent Systems</u>, Kluwer AcPress, 1995. • T. Ross, <u>Fuzzy logic with Engineering Applications</u>, McGraw Hill, 1995.

MATA KULIAH/ COURSE TITLE	TE091540: Elektronika Industri dan Otomasi TE091540: <i>Industrial Electronics and Automation</i> Credits: 4 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mempelajari beberapa sistem rangkaian elektronika untuk aplikasi di Industri dan konsep dasar perencanaan produksi barang elektronika. <i>Students learn some electronic circuit systems for applications in industry and the basic concept of electronic goods production planning</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami konsep dasar otomasi peralatan pada proses industri, • Mahasiswa mampu memahami kebutuhan-kebutuhan system peralatan elektronik di Industri, • Mahasiswa mampu membuat konsep dasar pembuatan system produksi barang elektronik, • Mahasiswa mampu mendesain diagram blok system kontrol pada peralatan Industri • Mahasiswa mampu memahami konsep dasar aplikasi PLC (Programmable Logic Control) • Mahasiswa mampu mendesain dengan tepat rangkaian elektronik untuk kebutuhan kontrol dan monitoring peralatan industri. • <i>Students are able to understand the basic concepts of automation equipment in industrial processes,</i> • <i>Students are able to understand the needs of electronic equipment systems in industry,</i> • <i>Students are able to make the basic concept of manufacturing electronic goods production system,</i> • <i>Students are able to design the control system block diagram of the Industrial equipment,</i> • <i>Students are able to understand the basic concept of application PLC (Programmable Logic Control),</i> • <i>Students are able to design exactly the circuit board for control and monitoring needs of industry equipment.</i>
POKOK BAHASAN/ SUBJECTS	• Otomatisasi proses pengemasan semen bubuk: conveyor, sensor volume, sensor berat, timer, counter, penjahitan, sensor proximity, klasifikasi barang produksi, kontrol motor dc, dan monitoring system terpusat • Catu daya: rectifier half & full wave, regulator tegangan, dan penguat arus

	• Monitoring barang produksi: up-counter, proximity switch, system transducer ultrasonic, system rangkaian opto-transistor, load cell, selenoide, converter analog to digital, RS-232 to current loop, RS-232 to 485 dan system komunikasi data terpusat (PC-base, mikrokontroler, dan PLC) • Pengontrolan peralatan produksi: rangkaian SCR, rangkaian TRIAC, rangkaian UJT, rangkaian Power transistor, rangkaian kontrol motor dc, dan rangkaian telekontrol peralatan produksi secara terpusat (PC-base, mikrokontroler, dan PLC); • Green design: charger battery, system PLTS, inverter, UPS, lampu elektronik hemat listrik, dan system manajemen energy listrik pelanggan kecil dan menengah. • <i>The scope of the Industrial Electronics; Automation of cement powder packaging process: conveyor, the sensor volume, weight sensors, timers, counters, sewing, proximity sensors, the classification of goods production, dc motor control, and centralized monitoring system; Power supply: half & full rectifier wave, voltage regulator, and amplifier currents; Monitoring the production of goods: up-counter, proximity switches, ultrasonic transducer system, the system OPTO-transistor circuits, load cell, selenoide, analog to digital converter, RS-232 to current loop, RS-232 to 485 and centralized data communications system (PC-base, microcontroller, and PLC); Control of production equipment: a series of SCR, TRIAC circuits, UJT circuits, Power transistor circuit, dc motor control circuit, and circuit telekontrol centralized production equipment (PC-base, microcontroller, and PLC); Green design: battery charger, PLTS system, inverter, UPS, power-efficient electronic lighting, and electrical energy management system small and medium customers.</i>
PUSTAKA UTAMA/ REFERENCES	• Timothy J. Maloney, <u>Modern Industri Electronics</u>, 4/E, Prentice-Hall, Inc.,2001 • A.P. Connolly, R.W. Fox, <u>SCR Manual Including Triac, and Other Thyristor</u>, Six Edition, General Electric, © 1979. • On Semiconductor, <u>Thyristor Theory and Design Considerations Handbook</u>, SCILLC,© 2005 • www.agilent.com/find/assist, <u>DC Powe Supply Handbook</u>, Agilent Technologies, ©1978, 2000 • P.R.K. Chetty, <u>Switching-Mode Power Supply Design</u>, BPB Publications,B-14, Connaught Place, New Delhi-1, © 1987

MATA KULIAH/ COURSE TITLE	TE091541: Machine Vision TE091541: Machine Vision Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami, menganalisa, dan merancang aplikasi machine vision <i>Giving knowledge to the students in order to understand the machine vision principles and its applications</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami aplikasi machine vision. • Mahasiswa mampu menganalisa aplikasi machine vision. • Mahasiswa mampu merancang aplikasi machine vision • <i>Students are able to analyze the machine vision systems</i> • <i>Students are able to design the machine vision systems.</i>
POKOK BAHASAN/ SUBJECTS	• Pendahuluan meliputi konsep dasar machine vision, akuisisi citra (image), representasi citra (image) • Image pre-processing meliputi pixel brightness transformations, geometric transformations, local pre-processing • Segmentation meliputi thresholding, edge-based segmentation, matching • Shape representation meliputi contour-based shape representation, region-based shape representation • Image understanding meliputi image understanding strategy, pattern recognition methods • 3D vision meliputi 3D vision task, geometry for 3D vision, radiometry and 3D vision; Motion analysis meliputi differential motion analysis method, optical flow. • <i>Introduction includes basic concept of machine vision, image acquisition, image representation, image pre-processing</i> • <i>Segmentation includes thresholding, matching;</i> • <i>Shape representation includes contour-based shape representation, region-based shape representation;</i> • <i>Image understanding includes image understanding strategy, pattern recognition methods</i> • <i>3D vision includes 3D vision task, geometry for 3D vision, radiometry and 3D vision</i>
PUSTAKA UTAMA/	• Linda G. Shapiro, <u>Computer Vision</u>, Prentice-Hall, Inc., 2001 • Milan Sonka dkk, <u>Image Processing: Analysis, and Machine Vision</u>,

REFERENCES

Brooks and Cole Publishing, 1998.

- Ramesh Jain, Machine Vision, McGraw-Hill, Inc., 1995
- Gary Bradski and Adrian Kaehler, Learning OpenCV: Computer Vision with OpenCV Library, O'Reilly Media, Inc., 2008

MATA KULIAH/ COURSE TITLE	TE091542: Robot Industri TE091542: <i>Industrial Robot</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami dan menganalisa aplikasi robot di industry <i>Giving knowledge to the students in order to understand the industrial robot and its applications.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami aplikasi robot di industri. • Mahasiswa mampu menganalisa aplikasi robot di industri. • <i>Students are able to analyze the industrial robot system.</i> • <i>Students are able to design the industrial robot system.</i>
POKOK BAHASAN/ SUBJECTS	• Pendahuluan meliputi robot industri, struktur mekanik robot • Kinematika meliputi kinematika robot industri, metoda Denavit-Hartenberg, joint space dan operational space, problem kinematika balik • Trajectory planning meliputi path and trajectory, joint space trajectories, operational space trajectories • Sensor dan aktuator meliputi joint actuating system, drives, proprioceptive sensors, exteroceptive sensors • Motion control meliputi problem kontrol, joint space control, operational space control • Force control meliputi interaksi robot dan lingkungan, compliance control, impedance control, hybrid position/force control • Visual servoing meliputi vision for control, position-based visual servoing, image-based visual servoing. • <i>Introduction includes robots in industry, mechanical structure of robot, sensors and actuators.</i> • <i>Kinematics includes forward kinematics, joint space and operational space, Denavit-Hartenberg (DH) method, inverse kinematics problem.</i> • <i>Trajectory planning includes path and trajectory, joint space trajectories, operational space trajectories.</i> • <i>Motion control includes joint space control, operational space control, compliance control, impedance control, hybrid position/force control.</i>

	• <i>Visual servoing includes vision for control, position-based visual servoing, image-based visual servoing.</i>
PUSTAKA UTAMA/ REFERENCES	• Bruno Siciliano, dkk, <u>Robotics: Modeling, Planning and Control</u>, Springer-Verlag Limited, 2009. • Appin Knowledge Solution, <u>Robotics</u>, Infinity Science Press, 2007. • Lung-Wen Tsai, <u>Robot Analysis</u>, John Wiley and Sons, Inc., 1999. • IEEE Transactions on Robotics and Automation

MATA KULIAH/ COURSE TITLE	TE091543: Sistem Kontrol Elektronika TE091543: <i>Electronic Control System</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami, menganalisa, dan merancang sistem kontrol elektronika analog dan digital. <i>Giving knowledge to the students in order to understand the analog and digital electronic control system</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami aplikasi elektronika pada sistem kontrol. • Mahasiswa mampu menganalisa sistem kontrol di industri. • Mahasiswa mampu merancang sistem kontrol untuk aplikasi spesifik • <i>Students are able to analyze the electronic control system.</i> • <i>Students are able to design the electronic control system.</i>
POKOK BAHASAN/ SUBJECTS	• Pendahuluan meliputi terminologi sistem kontrol, sejarah dan tren mendatang, overview kontrol analog dan digital • Pemrosesan sinyal meliputi domain waktu, domain frekuensi, kriteria kestabilan • Algoritma perancangan konvensional meliputi PID, root locus, respon frekuensi • Sistem kontrol berbasis state variable meliputi pole placement, state observer, state feedback dengan kontrol integral • Implementasi sistem kontrol meliputi sistem identifikasi, kontrol berbasis op-amp, kontrol digital berbasis mikroprosesor • Neural network dan fuzzy system meliputi kontrol dengan neural network, perancangan fuzzy controller, neuro-fuzzy controller. • <i>Introduction includes history and future trend, overview of analog and digital control, signal processing.</i> • <i>Classic design algorithm includes PID, root locus, frequency response.</i> • <i>State variable-based control system includes pole placement, state observer, state feedback with integral control.</i> • <i>Control system implementation includes system identification, op-amp-based analog control, microprocessor-based digital control.</i> • <i>Neural network and fuzzy system includes neural network-based</i>

	<i>control system, fuzzy logic control system, neuro-fuzzy control system.</i>
PUSTAKA UTAMA/ REFERENCES	• M. Sam Fadali, <u>Digital Control Engineering: Analysis and Design</u>, Elsevier Inc., 2009. • Chi-Tsong Chen, <u>Analog and Digital Control System Design</u>, Saunders College Publishing, 2005. • M Gopal, <u>Digital Control and State Variable Methods: Conventional and Neuro-Fuzzy Control System</u>, McGraw Hill Inc., 2003 • Kevin M. Passino and Stephen Yurkovich, <u>Fuzzy Control</u>, Addison-Wesley Longman, Inc., 1998

MATA KULIAH/ COURSE TITLE	TE091544: Divais Optoelektronika TE091544: Optoelectronic Devices Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami dan menganalisa sistem optoelektronika beserta aplikasinya. <i>Learning to optoelectronic device, component and system and its applications</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami secara mandiri sifat divais optoelektronika terbaru. • Mahasiswa mampu merencanakan dengan tepat sistim optoelektronika pada berbagai bidang aplikasi • <i>Students are able to understand the characteristics of the latest optoelectronic devices</i> • <i>Students are able to design the optoelectronic system in various fields of applications</i>
POKOK BAHASAN/ SUBJECTS	• Sifat cahaya: pemantulan, pembiasan, polarisasi, superposisi, interferensi dan difraksi, spectrum cahaya, monokromator. • Modulasi cahaya: Electro-Optic Effect, Magneto-Optic Effect, Acousto-Optic Effect. Displai: Cathode Ray Tube (CRT), Light Emitting Diode, LCD dan Plasma, Laser: dasar pembangkitan laser benda padat-isolator, semiconductor, laser zat cair, laser gas dan teknik Q-switching. • Detektor optik: thermo-electric, balometer, pneumatic, pyroelectric, vacuum photodiode, photomultiplier, photoconductive, photo diode, avalanche photodiode, schotthy photodiode, vidicon, pumblicon, CCD, digital camera. • Serat optik: Fiber Dispersions, Multimode step-index fiber, Single-mode fiber, Graded-index fiber, Fiber Losses, Optical Time-Domain Reflector (OTDR). • Optika terpadu: penjalaran cahaya dalam pandu gelombang, pembuatan slab\strip waveguide, modulator, switch, multiplexer, splitter. • Sistem komunikasi serat optik: Free Space Communication, Fiber Optical Communication System, Power Budget, Rise Time (Bandwidth) Budget, Multichannel Communication System, Code-Division Multiplexing (CDM), Coherent Optical Communication. • Aplikasi teknologi optoelektronika: Pengukuran jarak, spectrophotometer, optical storage, holografi. • <i>Light: nature and modulation of light</i>

	• <i>Optical devices: LED, LCD, Plasma, pyroelectric, photomultiplier, CCD, waveguide, switch and splitter</i> • <i>Laser: insulator, semiconductor, liquid dye and gas lasers</i> • <i>Optical communication system: Fiber Optics, Optical Fiber Communication System, Power and Bandwidth Budget</i> • <i>Optoelectronics applications: distance measurements, spectro-photometer, optical storage and holography</i>
PUSTAKA UTAMA/ REFERENCES	• J Wilson and JFB Hawkes, <u>Optoelectronics: An Introduction</u>, Prentice Hall, 1998. • Ronald W. Waynant and Marwood N. Ediger, <u>Electro-Optics Handbook</u>, McGraw-Hill, 2000. • Michael Bass, <u>Handbook of Optics: Fiber Optics & Nonlinear Optics</u>, McGraw-Hill, 2001 • Chinlon Lin, <u>Optoelectronic Technology and Lightwave Communications Systems</u>, Van Nostrand Reinhold, 1989. • Mark Johnson, <u>Photodetection and Measurement: Maximizing Performance in Optical Systems</u>, McGraw-Hill, 2003

MATA KULIAH/ COURSE TITLE	TE091545: Instr. & Pengolahan Sinyal Biomedika TE091545: Instrumentation & Processing of Biomedical Signal Credits: 4 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami prinsip-prinsip dan pengukuran dan instrumentasi dan sistem pemrosesan sinyal biomedika dan mampu mengembangkannya dalam praktek. <i>To have understanding of principles of measurment and instrumentation, and processing system of biomedical signals, and to have abilities to apply them in practional use</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami dan terampil menerapkan prinsip-prinsip pengukuran dan instrumentasi biomedika. • Mahasiswa memahami dan mampu menerapkan mathematical tool untuk pemrosesan sinyal biomedika. • Mahasiswa mampu merealisasikan sistem yang merupakan integrasi sistem instrumentasi dan sistem pemrosesan sinyal biomedika • <i>To have understanding and ability to apply basic principles of biomedical signal measurments and instrumentations.</i> • <i>To have understanding and ability to utilize mathematical tolls for biomedical signal processing.</i> • <i>To have capability in integrating instrumentation and processing system of biomedical signals.</i>
POKOK BAHASAN/ SUBJECTS	• Transduser dalam bidang biomedika • Sinyal biopotensial • Pengkondisi sinyal biopotensial • Pengamanan dalam instrumentasi biomedika • Digital filter untuk pemrosesan sinyal • <i>Biomedical transducers, biopotential signals: origin, generation, & characteristics, biopotential signal conditioning, safety in biomedical instrumentation, electrical surgery unit (ESU), digital filter for biomedical signal analysis, frequency-based analysis, time-frequency analysis, case studies</i>

**PUSTAKA
UTAMA/
REFERENCES**

- J. G. Webster, Medical Instrumentation, Application and Design, Houghton Mifflin Co, 1978
- Metin Akay (Ed), Biomedical Signal Detection, IEEE Press.
- J Bronzino (Ed), Biomedical Engineering Handbook, IEEE Press.

MATA KULIAH/ COURSE TITLE	TE091546: Teknik Biomedika TE091546: <i>Biomedical Engineering</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu mengembangkan sistem modeling dan analisa sistem biomedika untuk neural engineering, welfare, dan rehabilitation engineering. <i>To have a capability of developing modeling and analysis of biomedical system, i.e., neural engineering, welfare engineering, and rehabilitation engineering.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami bidang-bidang disiplin dalam biomedical engineering. • Mahasiswa mampu memanfaatkan mathematical tool untuk mengembangkan sistem modeling dan analisa sistem biomedika untuk kepentingan neural engineering, welfare engineering & rehabilitation engineering. • <i>To have an understanding of biomedical engineering disciplines.</i> • <i>To have a skill in utilizing mathematical tools for developing a modeling system and analysis of biomedical system, i.e., neural engineering, welfare engineering & rehabilitation engineering</i>
POKOK BAHASAN/ SUBJECTS	• Disiplin biomedical engineering • analisa dan pemodelan biomedika: nervous system, musculo-skeletal system, cardiac system, biomekanika, • welfare engineering, • rehabilitation engineering, • review jurnal. • <i>Biomedical engineering discipline</i> • <i>Biomedical analysis and modeling: nervous system, musculo-skeletal system, cardiac system, biomechanical</i> • <i>welfare engineering,</i> • <i>rehabilitation engineering</i> • <i>journal review</i>
PUSTAKA UTAMA/	• J Bronzino (Ed), <u>Biomedical Engineering Handbook</u>, IEEE Press. • Mark L Latash, <u>Neurophysiological Basis of Movement</u>, Human

REFERENCES

- Kinetics, USA, 1998.
- Roger M Enoka, Neuromechanics of Human Movement, Human Kinetics, USA, 3rd Ed, 2002.
 - RB Northrop, Introduction to Dynamic Modeling of Neuro-sensory Systems, CRC Press, 2001.

MATA KULIAH/ COURSE TITLE	TE091547: Biomekanika TE091547: <i>Biomechanics</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami landasan teori dan prinsip biomekanika dengan penekanan pada biomekanika gerakan manusia. <i>To have an understanding in fundamental theories and principles of biomechanics (emphasized in biomechanics of human movements).</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami karakteristik data biomekanika dan cara pengukurannya • Mahasiswa memahami biomekanika gerakan manusia • Mahasiswa mampu memanfaatkan prinsip-prinsip dalam biomekanika untuk analisa gerakan manusia. • <i>To have understanding of characteristics of biomechanical data and its measurement techniques.</i> • <i>To have understanding of biomechanics of human movements.</i> • <i>To have ability to utilize biomechanical principles to analyse human movement</i>
POKOK BAHASAN/ SUBJECTS	• Pendahuluan: besaran dan satuan dalam mekanika, prinsip-prinsip dasar mekanika, mekanika terapan, biomekanika, Gaya, moment, dan torsi, Analisa Statika dalam Biomekanika, Pengantar Ilmu Gerakan Manusia: goniometri dan pengukuran gerakan manusia, Kinematika dan Dinamika, Human Movement Analysis, Deformable body mechanics, Mechanical Properties of biological tissue • <i>Basic principles of mechanics, engineering mechanics, biomechanics, force, moment, static analysis, introductory human movement science: goniometry and human movement measurement, kinematics and dynamics, human movement analysis, deformable body mechanics, mechanical properties of biological tissue</i>
PUSTAKA UTAMA/	• Nihat Ozkaya, and Margareta Nordin, <u>Fundamentals of Biomechanics: Equilibrium, motion, and deformation</u>, 2nd edition, Springer-Verlag, New York, Inc., 1999.

REFERENCES

- B. M. Nigg and W Herzog, Biomechanics of the musculo-skeletal system, John Willey & Sons., Inc. 1995.
- Jack M. Winters, and Patrick F. Cargo (Eds.), Biomechanics and Neural Control of Posture and Movements, Springer-Verlag, NY, Inc., 2000.
- M. Enoka, Neuromechanics of Human Movements, 3rd edition, Human Kinetics, IL, 2002.
- J. Perry, Gait analysis: Normal and Pathological Functions, Slack Inc., NJ, 1992.
- M.W. Whittle, Gait analysis: an Introduction, Butterworth Heinemann, 3rd edition, Edinburg, 2002.
- Mark D. Grabiner, Current issues in biomechanics (Ed), Human Kinetics, 1993, USA.

MATA KULIAH/ COURSE TITLE	TE091548: Anatomi dan Fisiologi TE091548: <i>Anatomy and Physiology</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami dasar-dasar anatomi tubuh manusia dan fisiologi sell hingga sistem organ tubuh manusia dan mampu memanfaatkan pemahaman tersebut dalam disiplin rekayasa biomedika. <i>To have an understanding of fundamentals of anatomy and physiology of human body from cellular level to system organ level, and to have a capability to use the understanding in developing other understanding in biomedical engineering fields.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami anatomi tubuh manusia. • Mahasiswa memahami fisiologi manusia dari tingkat sel hingga sistem organ. • <i>To have an understanding in anatomy of human body.</i> • <i>To have an understanding of physiology of human body.</i>
POKOK BAHASAN/ SUBJECTS	• Cakupan anatomi dan fisiologi, anatomi dan fisiologi sell, anatomi dan fisiologi jaringan, sistem syaraf, sistem rangka, sistem otot, sistem kardiovaskular, sistem pulmonari, telaah jurnal bidang <i>applied physiology, biomechanis</i>, dll. <i>Scopes of anatomy and physiology, cellular level anatomy and physiology, tissue level anatomy and physiology, nervous system, skeletal system, muscular system, cardiovascular system, pulmonary system, selected topics from journal papers: applied physiology, biomechanics, etc.</i>
PUSTAKA UTAMA/ REFERENCES	• Wynn Kapit et. al., <u>Anatomy Coloring Book</u>, Benjamin Cumings Science Publishing, USA, 3rd Ed, 2002. • Wynn Kapit et. al., <u>Physiology Coloring Book</u>, Benjamin Cumings Science Publishing, USA, 2nd Ed, 2000. • Frederic H Martini et. al., <u>Fundamentals of Anatomy and Physiology</u>, Prentice Hall Intl. Inc., USA, 5th Ed, 2001.

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- Mark L Latash, Neurophysiological Basis of Movement, Human Kinetics, USA, 1998.
 - Roger M Enoka, Neuromechanics of Human Movement, Human Kinetics, USA, 3rd Ed, 2002.
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MATA KULIAH/ COURSE TITLE	TE091549: Topik Khusus Elektronika TE091549: <i>Special Topics in Electronics</i> Credits: 2 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu mengetahui dan memahami perkembangan terkini bidang elektronika. <i>To have ability to understand the current development on electronics engineering</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami aplikasi elektronika terkini. • Mahasiswa mampu mengaplikasikan salah satu perkembangan teknik elektronika terkini. • Mahasiswa mampu memberikan analisa perbandingan perkembangan terakhir bidang elektronika. • <i>To have ability to understand the current electronics application.</i> • <i>To have ability to apply the current electronic engineering development.</i> • <i>To have ability to analyze and compare the current development in electronics engineering.</i>
POKOK BAHASAN/ SUBJECTS	• Perkembangan terbaru di bidang device, • rangkaian dan sistem elektronika, • Computer aided design dan simulation. • Aplikasi terbaru dalam bidang elektronika yang meliputi elektronika biomedika dan industri. • <i>New development on devices technology</i> • <i>Electronic Circuit and system</i> • <i>Computer aided design dan simulation</i> • <i>Newest application on electronics, biomedical and industrial electronics</i>
PUSTAKA UTAMA/ REFERENCES	• Journal IEEE, CAS

SILABUS KURIKULUM/COURSE SYLLABUS

MATA KULIAH/ COURSE TITLE	TE091461: Analisis dan Desain Sistem Pengaturan TE091461: <i>Control System Analysis and Design</i> Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu melakukan analisa dan perancangan kompensator untuk sistem pengaturan, baik time-domain maupun frekuensi domain <i>The student able to analyze and design the compensator for control system in time-domain and frequency domain</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu melakukan analisis eror dan stabilitas pada sistem pengaturan • Mahasiswa mampu mendisain kompensator dalam domain frekuensi dan domain waktu (pendekatan state-space) • <i>The student able to analyze the stability of control system in time-domain and frequency domain</i> • <i>The student able to analyze and design the compensator for control system in time-domain and frequency domain</i>
POKOK BAHASAN/ SUBJECTS	• Analisa eror • Frekuensi respon • Disain kompensator pendekatan frekuensi domain • Disain kompensator pendekatan state-space • <i>Error analysis</i> • <i>Frequency response</i> • <i>Compensator design (frequency domain and time domain)</i>
PUSTAKA UTAMA/ REFERENCES	• Dorf Richard C, <u>Modern Control System</u>, 11th Ed, Pearson Education, Inc, 2008. • Ogata, Katsuhiko, <u>Modern Control Engineering</u>, 3rd Ed., Prentice-Hall 1997 • Kuo, B., <u>Automatic Control Systems</u>, 7th Ed., Prentice-Hall Int., 1995 • Gayakward, R. and Sokoloff, <u>Analog and Digital Control Systems</u>, Prentice-Hall Int. 1988

MATA KULIAH/ COURSE TITLE	TE091463: Teknik Variabel State TE091463: State Variable Engineering Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa menganalisis sistem dan merancang kompensator dalam bentuk state-space. <i>The student able to analyze and design the compensator for control system using state-space approach</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep state-space. • Mahasiswa mampu menganalisis sistem dalam bentuk state-space • Mahasiswa mampu merancang state-feedback dan observer based compensator. • <i>The student able to explain the concept of state-space</i> • <i>The student able to analyze and control system using state-space approach</i> • <i>The student able to design state-feedback and observer based compensator.</i>
POKOK BAHASAN/ SUBJECTS	• Representasi State-Space • State-Feedback • Observer • Observer based compensator • <i>Concept of state-space</i> • <i>State-Feedback</i> • <i>Observer</i> • <i>Observer based compensator</i>
PUSTAKA UTAMA/ REFERENCES	• William II, R. et.all, <u>Linear State Space Control Systems</u>, John Wiley and Sons Inc. 2007 • Rameli, Moch., <u>Diktat Kuliah Teknik Variabel State</u>, Teknik Sistem Pengaturan ITS • Chen, C.T., <u>Linear System Theory and Design</u>, Hold-Saunders International, 1984 • Kailath, T., <u>Linear Systems</u>, Prentice Hall New Jersey 1981 • Derusso, P.M. et.al, <u>State Variables for Engineers</u>, John Wiley and Sons Inc. 1965

MATA KULIAH/ COURSE TITLE	TE091465: Sistem Pengaturan Digital TE091465: <i>Digital Control System</i> Credits: 3 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang sistem pengaturan digital <i>Students are able to analyze and design a digital control systems</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa sistem pengaturan digital • Mahasiswa mampu merancang sistem pengaturan digital • <i>Students are able to analyze a digital control systems</i> • <i>Students are able to design a digital control systems</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem pengaturan digital • Konversi dan rekonstruksi sinyal • Analisis domain waktu pada sistem waktu diskrit • Analisis domain frekuensi pada sistem waktu diskrit • Perancangan controller digital • <i>Basic concepts of digital control systems</i> • <i>Conversion and signal reconstruction</i> • <i>Time domain analysis in discrete time systems</i> • <i>Frequency domain analysis in discrete time systems</i> • <i>Digital controller design</i>
PUSTAKA UTAMA/ REFERENCES	• Charles L. Phillips and H. Troy Nagle. Digital Control System Analysis and Design, third edition, Prentice Hall, 1995. • K. Ogata, Discrete-Time Control Systems, Second Edition, Englewood Cliffs, NJ: Prentice Hall, 1995, ISBN: 0-13-034281-5.

MATA KULIAH/ COURSE TITLE	TE091467: Teknik Numerik Sistem Linier TE091467: <i>Linear System Numerical Methods</i> Credits: 3 Semester: V
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menggunakan konsep matriks dan vektor (aljabar linear), mampu membuat algoritma dari konsep yang digunakan dengan bantuan software untuk memperoleh solusi sistem linear <i>The student should be able to use the concept of matrix and vector (linear algebra), and build algorithms for solving linear system problems</i>
KOMPETENSI/ COMPETENCY	• Mampu menggunakan konsep matriks dan vektor untuk sistem linear • Mampu membuat algoritma solusi dari konsep matriks dan vektor dengan bantuan software • <i>The student should be able to use the concept of matrix and vector to solve linear system problems</i> • <i>The student should be able to build an algorithm for solving the problems using software</i>
POKOK BAHASAN/ SUBJECTS	• Matriks, Determinan, Ruang vektor, Generalisasi ruang vektor, Ruang hasilkali-dalam (inner product space), Eigenvalue dan eigenvector, Transformasi linear • <i>Matrix, Determinants, Vector spaces, General vector spaces, Inner product spaces, Eigen-values and eigenvectors, Linear transformations</i>
PUSTAKA UTAMA/ REFERENCES	• Howard Anton and Chris Rorres, <u>Elementary Linear Algebra</u>, 7th Edition, John Wiley & Sons, New York, 1994. • Derek J.S. Robinson, <u>A Course in Linear Algebra with Applications</u>, 2nd edition, World Scientific Pub., New Jersey 2006. • David R. Hill and Cleve B. Moler, <u>Experiments in Computational Matrix Algebra</u>, New York, 1988. • Richard L. Burden and J. Douglas Faires, <u>Numerical Analysis</u>, 5th edition, PWS-Kent Pub., Boston, 1993. • James E. Gentle, <u>Matrix Algebra: Theory, Computations, and Applications in Statistics</u>, Springer Science, 2007. • Chi-Tsong Chen, <u>Introduction to Linear System Theory</u>, Holt, Rinehart and Winston, New York, 1970.

MATA KULIAH/ COURSE TITLE	TE091560: Sistem Pengaturan Waktu Riil TE091560: <i>Real Time Control System</i> Credits: 2 Semester: V (Pilihan/ <i>Optional</i>)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang sistem pengaturan waktu riil <i>Students are able to analyze and design real time control systems</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa sistem pengaturan waktu riil • Mahasiswa mampu merancang sistem pengaturan waktu riil • <i>Students are able to analyze an real time control systems</i> • <i>Students are able to design an real time control system</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem pengaturan waktu riil • Sampling dan diskritisasi controller • controller PID dan anti windup • concurrent programming • teori penjadwalan • fixed point arithmetic, interrupt dan pewaktuan • integrated scheduling and control • controller diskrit • <i>Basic concepts of real time control systems</i> • <i>Sampling and controller discretization</i> • <i>PID controller and anti wind up</i> • <i>Concurrent programming</i> • <i>Scheduling theory</i> • <i>Fixed point arithmetic, interrupt and timing</i> • <i>Integrated scheduling and control</i> • <i>Discrete controller</i>
PUSTAKA UTAMA/ REFERENCES	• <u>Real-time control systems</u>. Karl-Erik Årzen et. al. • <u>Computer Control: An Overview</u>. Björn Wittenmark et. al.

MATA KULIAH/ COURSE TITLE	TE091561: Informatika Industri TE091561: <i>Industrial Informatics</i> Credits: 3 Semester: V (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang informatika industri. <i>Students are able to analyze and design an industrial informatics</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa informatika industri • Mahasiswa mampu merancang informatika industri • <i>Students are able to analyze an industrial informatics</i> • <i>Students are able to design an industrial informatics</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar informatika industri • Sistem komunikasi data di industri • Sistem berbasis PLC, SCADA dan DCS • Human Machine Interface • Sistem informasi di industri • <i>Basic concepts of indstrial informatics</i> • <i>Data communication systems in industry</i> • <i>System based on PLC, SCADA and DCS</i> • <i>Human Machine Interface</i> • <i>Information systems in industry</i>
PUSTAKA UTAMA/ REFERENCES	• W.A. Halang, K.M. Sacha. Real-time systems : Implementation of industrial computerised process automation. Ed. World Scientific, 1992. • T. Boucher, A. Yalcin, Design of Industrial Information Systems, Elsevier, 2006

MATA KULIAH/ COURSE TITLE	TE091562: Pengaturan Sis. Pneumatik & Hidrolik TE091562: <i>Control of Pneumatic & Hydraulic Sys.</i> Credits: 2 Semester: V (Pilihan/ <i>Optional</i>)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu melakukan analisa dan perancangan kontroler pada sistem pneumatik dan hidrolik <i>The student able to analyze and design the controller for hydraulic and pneumatic system</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu melakukan analisa sistem pneumatik dan hidrolik • Mahasiswa mampu merancang kontroler sistem pneumatik dan hidrolik • <i>The student able to analyze the hydraulic and pneumatic system . The student able to design the controller for hydraulic and pneumatic system.</i>
POKOK BAHASAN/ SUBJECTS	• Dinamika fluida, Komponen kontrol sistem hidrolik, Komponen kontrol sistem pneumatik, Perancangan sistem kontrol hidrolik, Perancangan sistem kontrol pneumatik. • Fluidic dynamic, hydraulic control system components, pneumatic control system components, design hydraulic control system, design pneumatic control system
PUSTAKA UTAMA/ REFERENCES	• Mark W Spong, M Vidyasagar, <u>Robot Dynamics and Control</u>, John Wiley & Sons, 1989 • H Asada, JJE Slotine, <u>Robot Analysis and Control</u>, John Wiley & Sons, 1986

MATA KULIAH/ COURSE TITLE	TE091563: Sistem Dinamik TE091563: <i>Dynamic System</i> Credits: 2 Semester: V (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mata kuliah ini mengenalkan pemodelan system dynamic untuk keperluan menganalisa kebijakan dan strategi dalam proses industri atau proses bisnis. Mahasiswa akan belajar memvisualisasikan dinamika proses industri/bisnis dalam bentuk struktur yang terdiri dari beberapa variabel dan parameter serta kebijakan-kebijakan yang menghasilkan dinamika dan dapat diatur performansinya. <i>This course introduces the modeling of dynamic systems for analyzing policy and strategy in industrial processes or business processes. Students will learn to visualize the dynamics of the industry / business in the form of structure consisting of several variables and parameters and policies that generate the dynamic.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu mengevaluasi kebijakan dan strategi dalam proses industri/bisnis melalui simulasi model system dynamics. (C5-Evaluate). • Mahasiswa mampu mempraktekkan analisa kebijakan dan strategi dalam proses industri/bisnis dengan berperan sebagai asisten instruktur pelatihan system dynamics (A5-Pengamalan/characterization). • Mahasiswa akan terampil menggunakan perangkat lunak system dynamics untuk menganalisa kebijakan dan strategi dalam proses industri/bisnis (P3-Precision). • <i>The students are able to evaluate policies and strategies in the process industry / business through system dynamics simulation models</i> • <i>The students can practice the policy and strategy analysis in process industry / business with a role as an assistant training instructor dynamic system</i> • <i>The students will be skilled at using system dynamics software to analyze policies and strategies in the process industry / business</i>
POKOK BAHASAN/ SUBJECTS	• Pemodelan sistem: tahap-tahap pemodelan sistem dinamik, pengertian sebab-akibat, hubungan sebab-akibat, pengertian catubalik, representasi sistem dalam diagram sebab-akibat, pengertian level dan rate, representasi sistem dalam bentuk level dan rate, kebutuhan variabel bantu dan fungsi-fungsi khusus pada pemodelan sistem dinamik, persamaan matematik sistem dinamik; Penyelesaian persamaan matematik sistem dinamik sederhana;

	Model simulasi sistem dinamik; Penggunaan paket program simulasi sistem dinamik Vensim; Analisa hasil simulasi. Modeling the system: the stages of modeling dynamic systems, causality, the representation system in the causal diagram, and rate-level understanding, the representation system in the form rate and levels, mathematical dynamical systems; solving mathematical equations simple dynamical systems; dynamic system simulation models; use simulation program package Vensim dynamic system; Analysis of simulation results.
PUSTAKA UTAMA/ REFERENCES	- Sterman, J. <i>Business Dynamics: Systems Thinking and Modeling for a Complex World</i>. Irwin/McGraw Hill, 2000. - Roberts, N.A. et al. <i>Introduction to Simulation: Systems Dynamic Approach</i>. Addison Wesley, New York, 1982 - Forrester, J.W. "Industrial Dynamics", MIT Press, 1962 - COLE, R. "Management System Dynamics", Prentice Hall -----, "Vensim User's Guide", Ventana Systems, 2002

MATA KULIAH/ COURSE TITLE	TE091564: Sistem Even Diskrit TE091564: <i>Discrete Even System</i> Credits: 2 Semester: V (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memiliki pengetahuan sistem even diskrit dan aplikasinya. <i>The students have knowledge of discrete event systems and their applications.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami konsep sistem even diskrit dan mampu memodelkan, menganalisis dan mengatur sistem even diskrit dalam representasi Language, Automata, Petri Net, Diod Algebra, dan Logika. • <i>The students understood the discrete event systems concept, and able to modeling, analyze, and control of discrete event systems in represented Language, Automata, Petri Net, Diod Algebra, and Logical.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep Sistem Even Diskrit • Model-model Sistem Even Diskrit • Analisis Sistem Even Diskrit • Pengaturan Supervisor Sistem Even Diskrit • <i>Discrete event systems concept</i> • <i>Discrete event systems models</i> • <i>Discrete event systems analyze</i> • <i>Discrete event systems supervisory control</i>
PUSTAKA UTAMA/ REFERENCES	• C. G. Cassandras and S. Lafortune, Introduction to Discrete Event Systems, 2nd Edition, Springer, 2008 • Kumar Ratnesh, Vijay K. Garg, Modelling and Control of Logical Discrete Event Systems, Kluwer Academic Publishers, 1995. • E. M. Clarke, Jr., O. Grumberg and D. A. Peled, Model Checking, The MIT Press, 1999

MATA KULIAH/ COURSE TITLE	TE091565: Analisis Jaringan TE091565: <i>Network Analysis</i> Credits: 2 Semester: V (Pilihan/ <i>Optional</i>)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menyelesaikan problema optimasi menggunakan metode-metode optimasi jaringan <i>The students able to solve the problem of network optimization.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep teori graph • Mahasiswa dapat memodelkan persoalan optimisasi jaringan • Mahasiswa dapat menyelesaikan persoalan optimisasi jaringan • <i>The students able to explain graph theory.</i> • <i>The students able to build the model network optimization problem.</i> • <i>The students able to solve the network optimization problem.</i>
POKOK BAHASAN/ SUBJECTS	• Pengertian jaringan; teori graph; representasi graph dan jaringan; prosedur pemberian label; permasalahan lintasan terpendek; variasi dan aplikasi lintasan terpendek; algoritma lintasan terpendek; permasalahan spanning tree; variasi, aplikasi dan algoritma spanning tree; permasalahan aliran maksimum; variasi, aplikasi dan algoritma aliran maksimum; permasalahan transportasi dan transshipment; variasi, aplikasi dan algoritma transportasi dan transshipment; permasalahan biaya minimum; variasi, aplikasi dan algoritma biaya minimum; generalisasi aliran pada jaringan dan contoh-contoh aplikasinya; metode penyelesaian untuk salah satu contoh generalisasi aliran. • <i>Introduction to network, graph theory, network and graph representation, labeling procedure, short path problem and algorithm, spanning tree problem and algorithm, transportation problem, minimum cost problem, generalized flow network problem.</i>
PUSTAKA UTAMA/ REFERENCES	• Bertsekas, Dimitri P. Network Optimization: Continuous and Discrete Models. Athena Scientific, Massachusetts, 1998. • Philips, D.T. Fundamentals of Network Analysis. Prentice-Hall, New Jersey, 1980. • Jensen, P.A. dan J.W.Barnes. Network Flow Programming. John Wiley & Sons Inc., New York 1980. • Ahuja, Ravindra K., Thomas L Magnanti, James B Orlin. Network

Flow Analysis. Prentice-Hall, 1993

- Alkaff, Abdullah. Diktat Analisa Jaringan. Diktat Kuliah, TSP, JTE, 2000.

MATA KULIAH/ COURSE TITLE	TE091469: Penyelidikan Operasi TE091469: Operation Research Credits: 3 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memahami tentang konsep optimasi, memodelkan permasalahan optimasi, mencari penyelesaian dari model-model optimasi baik secara analitik maupun numerik termasuk bentuk khusus dari model optimasi seperti model linier dan model dinamik, serta melakukan analisa sensitivitas terhadap hasil optimasi <i>The students have knowledge of optimization, modeling and solving of optimization problem, and able to analyze the result of optimization.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menentukan model matematika suatu permasalahan optimasi dan mampu menyelesaikan berbagai macam bentuk permasalahan optimasi dengan pendekatan analitis • Mahasiswa mampu melakukan analisa sensitivitas terhadap permasalahan optimasi. • Mahasiswa mampu menyelesaikan persoalan optimasi dengan Program Dinamik. • Mahasiswa mampu menganalisa Sistem Antrian • <i>The students able to build the model of optimization problem, and able to solve the problem analytical</i> • <i>The students able to analyze the sensitivity of the optimization problem.</i> • <i>The students able to solve optimization problem using dynamic programming.</i> • <i>The students able to analyze the queuing system</i>
POKOK BAHASAN/ SUBJECTS	• Pengantar Konsep Optimasi, Dasar – Dasar Matematika Optimasi, Penyelesaian Analitis Permasalahan Optimasi, Penyelesaian Numerik Permasalahan Optimasi, Program Linier, Analisa Sensitivitas, Program Kuadratik, Program Dinamik, Sistem Antrian. • <i>Introduction to optimization, Basic Mathematic of Optimization problem, Analytic solution of optimization problem, Numeric solution of optimization problem, Linear programming, Sensitivity analysis, Quadratic programming, Dynamic programming, Queuing system.</i>
PUSTAKA UTAMA/ REFERENCES	• Hillier., Lieberman., <u>Introduction to Operation Research</u>, 8th Edition, Mc Graw Hill international Edition, 2004 • Hamdy A Taha., <u>Operation Research : an Introduction</u>, 8th Edition, Prentice Hall, 2006

MATA KULIAH/ COURSE TITLE	TE091471: Otomasi Sistem TE091471: System Automation Credits: 3 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang otomasi sistem <i>Students are able to analyze and design a system automation</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa otomasi sistem • Mahasiswa mampu merancang otomasi sistem • <i>Students are able to analyze a system automation</i> • <i>Students are able to design a system automation</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar otomasi sistem • Peralatan otomasi sistem • Perancangan diagram ladder berdasar sequence chart • Perancangan diagram ladder berdasar metode cascade • Perancangan diagram ladder berdasar metode Huffman • Perancangan diagram ladder untuk sistem dengan masukan acak • <i>Basic concepts of system automation</i> • <i>Components of system automation</i> • <i>Ladder diagram design based on sequence chart</i> • <i>Ladder diagram design based on cascade method</i> • <i>Ladder diagram design based on Huffman method</i> • <i>Ladder diagram design for a system with random input</i>
PUSTAKA UTAMA/ REFERENCES	• D. Pessen, Industrial Automation, Wiley, 1989 • S. Baranov, Logic Synthesis for Control Automata, Kluwer Academic Publisher, 1994 • Applying Structured Analysis To Automation Systems (Paper 1) • The Principles of State Logic Control (Paper 2) • Tadao Murata, Petri Nets: Properties, Analysis and Applications, Proceedings of the IEEE, vol.77, no 4, April 1989 (paper 3)

MATA KULIAH/ COURSE TITLE	TE091472: Kerja Lab.: Pengaturan Digital & Otomasi TE091472: Lab. Project: Digital & Auto. Control Credits: 2 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang controller digital dan otomasi industri. <i>Students are able to analyze and design a digital controller and industrial automation</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa controller digital • Mahasiswa mampu merancang sistem otomasi industri dan program pendukung untuk PLC • <i>Students are able to analyze a digital controller</i> • <i>Students are able to design a industrial automation system and supporting program for PLC</i>
POKOK BAHASAN/ SUBJECTS	• sampling dan rekonstruksi sinyal • filter digital • controller digital untuk mikrocontroller • controller digital untuk PC • pemrograman Programmable Logic Controller • Otomasi industri • <i>Sampling and signal reconstruction</i> • <i>Digital filter</i> • <i>Digital controller for microcontroller</i> • <i>Digital controller for PC</i> • <i>Programming for Programmable Logic Controller</i> • <i>Industrial automation</i>
PUSTAKA UTAMA/ REFERENCES	• Charles L. Phillips and H. Troy Nagle. Digital Control System Analysis and Design, third edition, Prentice Hall, 1995. • K. Ogata, Discrete-Time Control Systems, Second Edition, Englewood Cliffs, NJ: Prentice Hall, 1995, ISBN: 0-13-034281-5. • D Ibrahim, Microcontrolled Based Applied Digital Control, John Wiley & Sons, Ltd. ISBN: 0-470-86335-8, 2006

MATA KULIAH/ COURSE TITLE	TE091473: Instrumentasi Sistem Pengaturan TE091473: Control System Instrumentation Credits: 3 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu merancang sistem pengaturan beserta instrumentasi yang diperlukan sehingga objektif kontrol terpenuhi <i>The student should be able to design of control systems and learn about instruments (components) used in a control system to meet the design criteria.</i>
KOMPETENSI/ COMPETENCY	• Mampu merancang sistem pengaturan beserta instrumentasi yang diperlukan untuk suatu loop kontrol • Mampu membuat diagram sistem pengaturan dalam bentuk diagram fisik, blok dan instrumentasi (P&ID) untuk sist. pengaturan • <i>The student should be able to show ability to design of control systems and use the component needed in a control loop</i> • <i>The student should be able to build the control system diagrams, such as physical diagram, block diagram, and piping and instrumentation diagram (P&ID)</i>
POKOK BAHASAN/ SUBJECTS	• Introduksi intrumentasi dan sistem pengaturan, Pengkondisian sinyal analog, Pengkondisian sinyal digital, Sensor temperatur, Sensor level, pressure, weight dan flow, Elemen kontrol akhir, Komputer dalam sistem pengaturan, Sistem komunikasi pengaturan proses. • <i>Introduction of control systems instrumentation, Analog signal conditioning, Digital signal conditioning, Temperature sensors, Level, pressure, weight and flow sensors, Final control element, Computers in control systems, Communication systems in control systems</i>
PUSTAKA UTAMA/ REFERENCES	• Curtis D. Jonhson., <u>Process Control Instrumentation Technology</u>, 7th edition, PHI, New Jersey, 1989. • Wolfgang Altmann, <u>Practical Process Control for Engineers and Technicians</u>, John Elsevier, 2005 • W.L. Luyben, <u>Process Modeling, Simulation and Control for Chemical Engineers</u>, McGraw Hill, 2nd edition, 1990. • Karl J. Astrom, and Bjorn Wittenmark, "Computer-controlled systems: theory and design," 3rd edition, PHI, New Jersey, 1997.

MATA KULIAH/ COURSE TITLE	TE091566: Robotika TE091566: <i>Robotics</i> Credits: 3 Semester: VI (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu melakukan analisa kinematika dan dinamika robot <i>Students are able to analyze robot kinematic and dynamics</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu melakukan analisa kinematika robot • Mahasiswa mampu melakukan analisa dinamika robot • <i>Students are able to analyze robot kinematics</i> • <i>Students are able to analyze robot dynamics</i>
POKOK BAHASAN/ SUBJECTS	• Transformasi Koordinat • Kinematika robot • Differential motion • Dinamika robot • Perencanaan trayektori • Robotic Control • <i>Coordinate transformation</i> • <i>Robot kinematics</i> • <i>Differential motion</i> • <i>Robot dynamics</i> • <i>Trajectory planning</i> • <i>Robotic control</i>
PUSTAKA UTAMA/ REFERENCES	• Mark W Spong, M Vidyasagar, <u>Robot Dynamics and Control</u>, John Wiley & Sons, 1989 • H Asada, JJE Slotine, <u>Robot Analysis and Control</u>, John Wiley & Sons, 1986

MATA KULIAH/ COURSE TITLE	TE091567: Sistem Pengaturan Proses TE091567: <i>Process Control System</i> Credits: 2 Semester: VI (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu mendesain sistem pengaturan proses untuk proses real skala laboratorium <i>The student should be able to design a process control system for the real process (process rig)</i>
KOMPETENSI/ COMPETENCY	• Mampu mendesain sistem pengaturan proses • Mampu membuat diagram simulasi dan implementasi sistem pengaturan proses menggunakan proses real skala laboratorium • <i>The student should be able to show ability to design of process control system</i> • <i>The student should be able to build the simulation and implementation diagram of the control system for real process using software and tools</i>
POKOK BAHASAN/ SUBJECTS	• Introduksi sistem pengaturan proses, Model matematika proses, Kontroler berbasis model, Kontrol loop, Desain konseptual sistem pengaturan proses, Desain simulasi sistem pengaturan proses, Desain implementasi sistem pengaturan proses • <i>Introduction to process control system, Mathematical modeling of dynamic processes, Model-based controller, Control loops, Conceptual design of process control systems, Simulation of the designed control systems, Implementation and testing of the designed control system using the real process</i>
PUSTAKA UTAMA/ REFERENCES	• Curtis D. Jonhson., <u>Process Control Instrumentation Technology</u>, 7th edition, PHI, New Jersey, 1989. • Wolfgang Altmann, <u>Practical Process Control for Engineers and Technicians</u>, John Elsevier, 2005 • W.L. Luyben, <u>Process Modeling, Simulation and Control for Chemical Engineers</u>, McGraw Hill, 2nd edition, 1990.

MATA KULIAH/ COURSE TITLE	TE091568: Pengaturan Sistem Energi Listrik TE091568: Control of Electric Energy System Credits: 2 Semester: VI (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menjelaskan pemodelan, pengaturan dan analisa stabilitas sistem tenaga listrik <i>The student able to explain modeling, control and analysis electric energy system.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu melakukan pemodelan sistem tenaga listrik • Mahasiswa mampu menjelaskan metode pengaturan sistem tenaga listrik • Mahasiswa mampu melakukan analisa stabilitas sistem tenaga listrik • <i>The student able to build electric energy system models.</i> • <i>The student able to explain the electric energy system control methods</i> • <i>The student able to analyze the electric energy system stability</i>
POKOK BAHASAN/ SUBJECTS	• Konsep stabilitas sistem energi elektrik, Pemodelan dan analisa mesin Sinkron, Komponen sistem energi listrik ,Transfer daya, Model beban dan sistem eksitasi, Model pembangkit hydro dan thermal, Pengaturan daya dan Stabilitas sistem tenaga listrik. • <i>Stability of electric energy system, Modeling and analysis of synchronous machines, electric energy system components, power transfer, loading models and exciting system, hydro and thermal model, power control, stability of electric energy system.</i>
PUSTAKA UTAMA/ REFERENCES	• KUNDUR, Prabha, <u>Power System Stability and Control</u>, EPRI, McGraw-Hill, 1994 • ELGERD, Olle I., <u>Electric Energy System Theory : An Introduction</u>, McGraw-Hill, 1971

MATA KULIAH/ COURSE TITLE	TE091569: Sistem Pengaturan Ditebar TE091569: <i>Distributed Control System</i> Credits: 3 Semester: VI (Pilihan/ <i>Optional</i>)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang distributed control system. <i>Students are able to analyze and design a distributed control systems</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa distributed control system • Mahasiswa mampu merancang distributed control system • <i>Students are able to analyze a distributed control systems</i> • <i>Students are able to design a distributed control systems</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar distributed control system • Aplikasi PLC, SCADA di industri • Paket dasar DCS dan integrasinya • Penggunaan Fieldbus • Aplikasi DCS di industri • <i>Basic concepts of distributed control systems</i> • <i>Aplication of PLC, SCADA in industry</i> • <i>Fundamental packet of DCS and its integration</i> • <i>Aplication of Fieldbus</i> • <i>Aplication of DCS in industry</i>
PUSTAKA UTAMA/ REFERENCES	• William S Levine. The control Handbook CRC Press March 1916 • MP Lukae Distributed Control Systems: Thein Evaluation &Design Van Nostrant Reinhold Company 1986 • Instruments Engineers Handbook Vol-II, Process Control 3rd Edition 1995, "Bela G, LIPTAK", Chilton • Distributed computer control for Industrial Automation, "Popovic and Bhatkar", Dekker. • Computer-based Industrial Controls, "Krishan Kant", PHI. • Applications of computers in Process Control, "Considine". • Modern Control Techniques for the process industries, "T.HTsai , J.W Lane", Mareet Dekkar, N.Y 1986. • Digital Control System, "Iserman". • Programmable logic controller, "J.D.Otter", (PHI). • Industrial Programmable controller, "Huges", (ISA).

MATA KULIAH/ COURSE TITLE	TE091570: Teknik Keandalan & Keselamatan Sistem TE091570: System Reliability & Safety Engineering Credits: 3 Semester: VI (Pilihan/Optional)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memiliki pengetahuan teknik keandalan dan keselamatan sistem dan aplikasinya. <i>The students have knowledge of reliability engineering and safety systems, and their applications.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa memahami konsep keandalan dan keselamatan sistem dan mampu memodelkan dan menganalisis keandalan dan keselamatan sistem. • <i>The students understood the reliability engineering and safety systems concept, and able to modeling and analyze of reliability engineering and safety systems.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep keandalan dan keselamatan sistem • Model-model keandalan dan keselamatan sistem • Analisis keandalan dan keselamatan sistem • <i>Reliability engineering and safety systems concept</i> • <i>Reliability engineering and safety systems models</i> • <i>Reliability engineering and safety systems analysis</i>
PUSTAKA UTAMA/ REFERENCES	• Abdullah Alkaff, <u>Diktat Teknik Keandalan Sistem</u> • Lewis, E.E., <u>Introduction to Reliability Engineering</u>, John-Wiley, New York 1994 (2nd Ed.). • B.S. Dhillon, <u>Reliability, Quality, and Safety for Engineers</u>, CRC Press, 2005

MATA KULIAH/ COURSE TITLE	TE091571: Simulasi Sistem TE091571: System Simulation Credits: 2 Semester: VI (Pilihan/ <i>Optional</i>)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami teori dan aplikasi simulasi sistem dan memiliki kemampuan untuk melakukan simulasi sistem dengan program paket <i>The students have understanding about theory and applications of system simulation and have ability to design and implement system simulation using package software.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menyusun model simulasi untuk permasalahan sistem • Mahasiswa mampu menyatakan model simulasi dengan paket program simulasi • Mahasiswa mampu melakukan eksperimen terhadap sistem dengan menggunakan model simulasi • Mahasiswa mampu melakukan analisis statistik terhadap hasil simulasi • Mahasiswa mampu mengambil kesimpulan dari hasil analisis, serta memberi interpretasi penerapan hasil yang diperoleh • <i>The student should be able to develop simulation model to solve a problem</i> • <i>The student should be able to realize the model in a simulation package software</i> • <i>The student should be able to perform experiments using simulation model</i> • <i>The student should be able to analyze of simulation results</i> • <i>The student should be able to take conclusions and make interpretation from results analysis</i>
POKOK BAHASAN/ SUBJECTS	• Pemodelan simulasi sistem, Realisasi simulasi sistem dengan program paket, Analisis simulasi sistem, Concept of systems simulation modeling. • <i>Simulation analysis methods, Simulation accuracy measurement and analysis, sample size determination, stopping criteria, mean and variance calculation, random numbers generation, static systems simulation, Concept of state, event, and statistics, time advance concept, systems simulation organization, continuous time systems simulation.</i>
PUSTAKA UTAMA/	• W.D. Kelton, R.P. Sadowski, D.T. Sturrock, <u>Simulation with Arena</u>, 3rd Ed, McGraw Hill Higher Education, 2003.

REFERENCES

- A.M. Law, W.D. Kelton, Simulaton, Modeling and Analysis, 2nd Ed McGraw Hill, 1991.
- R.E. Shannon, Systems Simulation: The Art and Science, Prentice-Hall 1978

MATA KULIAH/ COURSE TITLE	TE091474: Perancangan dan Integrasi Sistem TE091474: System Design and Integration Credits: 4 Semester: VII
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mata kuliah ini membahas tentang perancangan suatu sistem, mengevaluasi suatu hasil rancangan, membandingkan beberapa hasil rancangan, menentukan rancangan yang terbaik dari kesemuanya, dan mengintegrasikan rancangan yang terpilih dalam bentuk arsitektur teknologi yang uniform. <i>This course discuss about designing a system, evaluate the result of design, compare with the others result of design, decide the best design and then integrate the chosen design in the form a uniform technology architecture</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu mengintegrasikan hasil rancangan suatu sistem dengan memadukan teknologi, aplikasi, data dan komunikasi ke dalam satu struktur kerja fungsional dengan bentuk arsitektur teknologi yang uniform. • Mahasiswa mampu mempublikasikan hasil rancangan dan integrasi sistem dalam bentuk poster di lingkungan jurusan teknik elektro. • <i>Students are able to integrate the result of design</i> • <i>Students are able to publish the result of designing in the form a poster</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem • Proses perancangan sistem • Definisi kebutuhan sistem • Rancangan konseptual, fungsional, detail • Pengujian • Perancangan dari segi keandalan, perawatan, manajemen, dan ekonomis; • Definisi dan arsitektur integrasi sistem: • Tipe dan infrastruktur integrasi • Teknologi dan proses integrasi, dan implementasi sistem. • <i>Basic concepts of a system</i> • <i>System design processes</i> • <i>Definition of system requirements</i> • <i>Conceptual, fungsional and detail design</i> • <i>Testing</i>

	• <i>Designing according to reliability, maintenance, management and economics</i> • <i>Definition and architecture of system integration</i> • <i>Type and infrastructure of integration</i> • <i>Technology and process of integration, and system implementation</i>
PUSTAKA UTAMA/ REFERENCES	• Wasson, Charles S. System Analysis, Design, and Development: Concepts, Principles, and Practices. John Wiley & Sons, New Jersey, 2006 • Blanchard, B.S., W.J. Fabrycky. Systems Engineering and Analysis. 2nd edition, Prentice-Hall, New Jersey, 1992. • Juric, Matjaz B., Ramesh Loganathan, Poornachandra Sarang, & Frank Jennings. SOA Approach to Integration. Packt Publishing, Birmingham, 2007 • Ruh, William A., Francis X. Maginnis, & William J. Brown. Enterprise Application Integration. John Wiley & Sons, Inc., 2001. • Myerson, Judith M. Enterprise Systems Integration. CRC Press Company, 2002. • Miller, Thomas E., Daryle W. Berger. Totally Integrated Enterprises. Raytheon Professional

MATA KULIAH/ COURSE TITLE	TE091475: Sistem Pengaturan Optimal TE091475: <i>Optimal Control System</i> Credits: 3 Semester: VII
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu merancang sistem pengaturan yang optimal melalui kriteria minimum energi maupun minimum waktu untuk sistem waktu-kontinyu dan waktu-diskrit <i>The student should be able to design optimal control systems via minimum-energy and minimum-time criteria for continuous-time and discrete-time systems</i>
KOMPETENSI/ COMPETENCY	• Mampu menggunakan konsep optimal dalam mendesain sistem kontrol optimal untuk plant linear • Mampu membuat algoritma sistem kontrol optimal untuk keperluan simulasi dan implementasi sistem kontrol hasil desain menggunakan Matlab dan Simulink. • <i>The student should be able to use the concept of optimal control to design a control system of linear plant, and validate the designed control system using numerical simulation and implementation to the real plant</i> • <i>The student should be able to build the optimal control system algorithms using Matlab and Simulink</i>
POKOK BAHASAN/ SUBJECTS	• Teknik Optimasi, Variasi kalkulus Hamilton, Linear Quadratic Regulator, Linear Quadratic Tracking, Kontrol optimal berbasis output feedback, State estimator, Kontrol optimal waktu-minimum, Robustness desain, Aplikasi kontrol optimal. • <i>Optimization techniques , Hamilton calculus of variation, Linear Quadratic Regulator, Linear Quadratic Tracking, Optimal control via output feedback, State estimator, LQG/LTR, Minimum-time optimal control, Robustness design, The application of optimal control to the real plant</i>
PUSTAKA UTAMA/ REFERENCES	• Anderson,B.D.O., <u>Optimal Control: Linear Quadratic Methods</u>, PHI, New Jersey, 1989. • Frank L. Lewis, Vassilis L. Syrmos, <u>Optimal Control</u>, John Wiley & Sons Inc., New York, 1995 • Frank L. Lewis, <u>Applied Optimal Control and Estimation</u>, PHI, New Jersey, 1992. • Trihastuti Agustinah, <u>Diklat Kuliah Sistem Pengaturan Optimal</u>,

MATA KULIAH/ COURSE TITLE	TE091476: Pengolahan Sinyal Pengaturan TE091476: Control Signal Processing Credits: 3 Semester: VII
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memiliki pengetahuan tentang metode estimasi parameter sistem dan estimasi state dan implementasinya. <i>The students have working knowledge about system identification and state estimation.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep identifikasi dalam pemodelan sistem pengaturan. • Mahasiswa mampu merancang filter Kalman untuk mengestimasi state sistem. • Mahasiswa mampu melakukan implementasi sistem identifikasi dan estimasi state menggunakan komputer. • <i>The student are able to use the concept of system identification to build model for control system applications</i> • <i>The student are able to design Kalman filter to estimate state of a system.</i> • <i>The student are able to impelement system identification and state estimation using computer.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep identifikasi dan estimasi, Permodelan sistem, Identifikasi sistem: nonparametrik dan parametrik, time domain dan frekuensi domain, Filter Wiener dan filter Kalman, Smoothing dan filter Kalman extended. • <i>Concept of system identification and state estimation, System modeling, System identification : nonparametric and parametric, time and frequency domain, model validation, Wiener filter, Kalman filter, Smoothing, extended Kalman filter</i>
PUSTAKA UTAMA/ REFERENCES	• T. Söderström, P. Stoica, <u>System Identification</u>, Prentice Hall 1989. • R.G. Brown, P.Y.C. Hwang, <u>Introduction to Random Signals dan Applied Kalman Filtering</u>, 3rd Ed, John Wiley and Sons, 1997. • D. Simon, <u>Optimal State Estimation – Kalman, H∞ and Nonlinear Approaches</u>, John Wiley and Sons, 2006 • J.M. Mendel, <u>Lessons in Estimation Theory for Signal Processing, Communications, and Control</u>, Prentice Hall International, 1995

MATA KULIAH/ COURSE TITLE	TE091572: Telemetri dan Pengaturan Remote TE091572: Remote Telemetry and Control Credits: 3 Semester: VII (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang sistem pengukuran dan pengaturan remote. <i>Students are able to analyze and design an remote control and measurement systems</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu merancang dan menganalisa sistem pengukuran remote • Mahasiswa mampu merancang dan menganalisa sistem pengaturan remote • <i>Students are able to design and analyze an remote measurement system</i> • <i>Students are able to design and analyze an remote control system</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem pengukuran dan pengaturan remote • Komponen penyusun sistem telemetri dan remote control • Teori kuantisasi, mu-demux • Perancangan sistem telemetri • Perancangan sistem pengaturan remote • <i>Basic concepts of an remote control and measurement systems</i> • <i>Components of telemetry system and remote control</i> • <i>Quantization theory, mux-demux</i> • <i>Telemetry system design</i> • <i>Remote control system design</i>
PUSTAKA UTAMA/ REFERENCES	• Swobada G - Telecontrol Method and Application of telemetering and remote control - Van Nostrand, 1971. • Schwartz M - Information Transmission - Modulation & Noise - MGH, 1970. • Gruenberg E L - Handbook of Telemetry and telecontrol - MGH, 67 • Carley B A - Communication system - Introduction to signals and noise in electrical communications - MGH, Int. student. Edn. • D Patranabis - Telemetry principles - Tata McGraw Hill.

MATA KULIAH/ COURSE TITLE	TE091573: Sistem Pengaturan Cerdas TE091573: <i>Intelligent Control System</i> Credits: 2 Semester: VII (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang sistem pengaturan cerdas. <i>Students are able to analyze and design an intelligent control systems</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa sistem pengaturan cerdas • Mahasiswa mampu merancang sistem pengaturan cerdas • <i>Students are able to analyze an intelligent control systems</i> • <i>Students are able to design an intelligent control systems</i>
POKOK BAHASAN/ SUBJECTS	• Konsep dasar sistem pengaturan cerdas • Fuzzy logic control • Artificial neural networks • Genetic algorithms • <i>Basic concepts of intelligent control systems</i> • <i>Fuzzy logic control</i> • <i>Artificial neural networks</i> • <i>Genetic algorithms</i>
PUSTAKA UTAMA/ REFERENCES	• Neuro-fuzzy and Soft Computing, by Jang, Sun & Mizutani, Prentice Hall, 1997. • Goldberg, D. E., Genetic Algorithms in Search, Optimization and Machine Learning, Addison-Wesley, Reading, MA, 1989, Chaps. 1 and 4, pp. 77, 106-122 • Fuzzy Control, Kevin M. Passino and Stephen Yurkovich, Addison-Wesley Longman Inc., 1998. • Soft Computing and Intelligent Systems Design – Theory, Tools, and Applications, F.O.Karray and C.W.de Silva, Addison-Wesley, 2004. • Fuzzy Sets and Fuzzy Logic, G.J.Klir and B.Yuan, Prentice-Hall, 1995. • Adaptive Approximation Based Control, J.A.Farrell and M.M.Polycarpou, Wiley, 2006. • In Introduction to Fuzzy Sets, by Pedrycz & Gomide, MIT Press, 1998. • Evolutionary Computation, by Dumitrescu et al., CRC, 2000.

MATA KULIAH/ COURSE TITLE	TE091574: Pengaturan Penggerak Elektrik TE091574: <i>Control of Electric Drives</i> Credits: 3 Semester: VII (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menjelaskan cara kerja motor drive dan mampu merancang kontroler untuk motor drive <i>The students able to explain and design controller for motor drive</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan cara kerja motor drive • Mahasiswa mampu merancang kontroler untuk motor drive • <i>The students able to explain motor drive operation</i> • <i>The students able to design controller for motor drive</i>
POKOK BAHASAN/ SUBJECTS	• Dinamika motor dc, Pengaturan motor dc, Dinamika motor induksi, Pengaturan motor induksi, Pengaturan motor sinkron. • <i>Dynamic of DC Motor, DC Motor Controls , Dynamic of induction motor, induction motor control, synchronous motor control.</i>
PUSTAKA UTAMA/ REFERENCES	• Polka, Dave :“Motor and Drive : A Practical Technology Guide”, ISA – The Instrumentation, Systems, and Automation Society, 2003. • DUBEY, Gopal K, <u>Power Semiconductor Controlled Drives</u>, Prentice Hall, Inc., 1989 • Subrahmanyam, Vedam, <u>Electric Drives Concepts & Applications</u>, McGraw-Hill, 1996.

MATA KULIAH/ COURSE TITLE	TE091575: Sistem Pengaturan Adaptif TE091575: <i>Adaptive Control System</i> Credits: 2 Semester: VII (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menganalisa dan merancang sistem pengaturan adaptif. <i>The students able to analyze and design adaptive control system</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menganalisa sistem pengaturan adaptif • Mahasiswa mampu merancang sistem pengaturan adaptif • <i>The students able to analyze adaptive control system</i> • <i>The students able to design adaptive control system</i>
POKOK BAHASAN/ SUBJECTS	• Konsep sistem pengaturan adaptif, Sistem Pengaturan adaptif Direct-Indirect, Sistem Pengaturan adaptif MRAC, Estimasi Parameter, Sistem Pengaturan adaptif Self-Tuning, Stabilitas Sistem Pengaturan Adaptif, Sistem Pengaturan adaptif Stokastik. • <i>Introduction to adaptive control system, Direct-Indirect adaptive control system, Model Reference Adaptive Control System (MRAC), Parameters Estimation, Self-Tuning Adaptive Control System, Stability of Adaptive Control System, Stochastic Adaptive Control System.</i>
PUSTAKA UTAMA/ REFERENCES	• Astrom, KJ and Wittenmark, B., <u>Adaptive Control</u>, Addison-Wesley, 1997 • Landau, ID, <u>System Identification and Control Design</u>, Prentice-Hall, 1990 • Sastry, S. and Bodson, M, <u>Adaptive Control Stability, Convergence and Robustness</u>, Prentice-Hall Advanced Reference Series, 1989

MATA KULIAH/ COURSE TITLE	TE091576: Teknologi Keputusan TE091576: <i>Decision Technology</i> Credits: 2 Semester: VII (Pilihan/Optional)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mata kuliah ini membahas tentang penggunaan teknologi (perangkat lunak) dalam pengambilan keputusan untuk menyelesaikan permasalahan optimasi yang meliputi pemrograman matematis (mathematical programming), optimasi jaringan (network optimization), model probabilistik (probabilistic models) dan pemodelan open-standard untuk optimasi. <i>This course discuss about application of technology in decision making for optimization problem, which includes mathematical programming, network optimization, probabilistic models and open-standard models.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu membuat keputusan untuk permasalahan optimasi menggunakan metode-metode penyelidikan operasi dengan bantuan perangkat lunak (C6-Create). • Mahasiswa mampu mempraktekkan sebagai asisten instruktur pelatihan teknologi keputusan untuk permasalahan optimasi (A5-Pengamalan/characterization). • Mahasiswa akan terampil menggunakan perangkat lunak keputusan untuk menyelesaikan permasalahan optimasi secara cepat dan tepat menggunakan metode-metode penyelidikan operasi (P3-Precision). • <i>The student able to make decision for optimization problem.</i> • <i>The student able to practice as instructor assistant for decision technology training</i> • <i>They became skilled student to use decision making soft-ware.</i>
POKOK BAHASAN/ SUBJECTS	• Pemrograman matematik : program linier, program nolinier, program integer/bilangan bulat, program dinamik. • Optimisasi jaringan : lintasan terpendek, aliran maksimum, biaya minimum, Model probabilitas : analisa keputusan, optimisasi stokastik, pemodelan open-standard. • <i>Mathematical Programming: Linear Programming, Nonlinear Programming, Integer Programming, Dynamic Programming;</i> • <i>Network Optimization: Shortest Path, Maximum Flow, Minimum Cost; Probabilistic Models: Decision Analysis, Markov Decision Processes, Stochastic Optimization; Open-standard Modelling.</i>
PUSTAKA UTAMA/	• Liberatore, M., and Nydick, R., <i>Decision Technology: Modeling, Software, and Applications</i>, John Wiley & Sons, New York, 2003,

REFERENCES

ISBN 0-471-41712-2.

- Hillier., Lieberman., "Introduction to Operation Research", 8th Edition, Mc Graw Hill international Edition, 2004.
- Hamdy A taha., "Operation Research : an Introduction", 8th Edition, Prentice Hall, 2006.

MATA KULIAH/ COURSE TITLE	TE091577: Jaringan Stokastik TE091577: Stochastic Networks Credits: 2 Semester: VII (Pilihan/Optional)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memahami tentang Proses Markov waktu kontinyu, jaringan stokastik kontinyu dasar maupun kompleks seperti jaringan Jackson, Kelly dan Whittle, mampu menganalisis berbagai model sistem antrian dan jaringan sistem antrian baik tertutup maupun terbuka dan menghitung kinerjanya, serta memahami sistem stokastik diskrit. <i>The students have knowledge of continuous time process Markov , stochastic networks, and able to analyze the queueing system, network systems and discrete stochastic system.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu memahami dan menjelaskan Proses Markov waktu kontinyu. • Mahasiswa mampu menganalisis berbagai model Sistem Antrian. • Mahasiswa mampu menjelaskan dan menganalisis Lintasan Layanan Stokastik Kontinyu. • Mahasiswa mampu menganalisis jaringan stokastik Jackson, Kelly dan Whittle. • Mahasiswa mampu menjelaskan dan menganalisis sistem stokastik diskrit. • <i>The students have knowledge and able to explain continuous time process Markov.</i> • <i>The students able to analyze queueing system models</i> • <i>The students able to explain and analyze continuous stochastic service paths.</i> • <i>The students able to analyze Jackson, Kelly and Whittle stochastic networks</i> • <i>The students able to explain and analyze discrete stochastic system</i>
POKOK BAHASAN/ SUBJECTS	• Sistem dan Jaringan Stokastik waktu kontinyu, Sistem Antrian M/M/1, Sistem Antrian M/M/s, Sistem Antrian M/M/s/K, Sistem Antrian M/M/ ∞ . Ukuran kinerja sistem antrian, Lintasan Layanan Stokastik Kontinyu, Jaringan Stokastik Jackson Terbuka , Jaringan Stokastik Jackson Tertutup, Jaringan Stokastik Kelly, Jaringan Stokastik Whittle, Sistem dan Jaringan Stokastik Diskrit. • <i>Continuous time Stochastic System and Networks, Queueing System (M/M/1, M/M/s, M/M/s/K, and M/M/∞), Performance of queueing system, continuous stochastic service paths, Jacson</i>

	<i>stochastic networks (open and closed). Kelly and Whittle stochastic networks, discrete stochastic system.</i>
PUSTAKA UTAMA/ REFERENCES	• Hillier., Lieberman., "Introduction to Operation Research", 8th Edition, Mc Graw Hill international Edition, 2004 • Leonard Kleirock, " Queueing Systems", Volume 1, Wiley Interscience, 1975 • Narayan Bhat., "An Introduction to Queueing Theory : Modelling and Analysis in Applications", 2008. • Richard Serfozo., "Introduction to Stochastic Network", Springer-Verlag New York City, 1999. • G. Bolch, S. Greiner, Herman de Meer, Trivedi, "Queueing Networks and Markov Chains: Modeling and Performance Evaluation with Computer Science Applications" 2nd Edition, John Wiley and Son, 2006 • Trivedi, "Probability and Statistics with Reliability, Queueing, and Computer Science Applications", 2nd Edition, John Wiley and Son, 2002

MATA KULIAH/ COURSE TITLE	TE091570: Sistem Multi-Agen TE091570: Multi-Agent System Credits: 2 Semester: VII (Pilihan/Optional)
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan teori dasar sistem multi agen dan aplikasinya pada teknik sistem dan pengaturan. <i>The students have basic knowledge of multi-agent system and its applications in control system</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mengetahui dan mampu menjelaskan teori dan aplikasi sistem multi agen. • Mahasiswa mengetahui dan mampu melakukan analisis sistem multi agen. • Mahasiswa memahami kendala dan pertimbangan dalam disain sistem multi agen. • <i>The student should be able to explain basic concept of multi-agent system</i> • <i>The student should be able to give examples of multi-agent system applications in control systems</i> • <i>The student should be able to understand constraint and considerations in multi-agent system design</i>
POKOK BAHASAN/ SUBJECTS	• Teori agen, Sistem multi agen, Arsitektur sistem multi agen dan interaksi agen, Disain multi agen. • <i>Introduction to distributed intelligent systems, Intelligent agen, properties of intelligent agent, Architecture of multi-agent system, interaction among agents, Multi-agent system design: constraint and considerations, applications.</i>
PUSTAKA UTAMA/ REFERENCES	• M.Wooldridge, <u>An Introduction to Multiagent Systems</u>, John Wiley and Sons 2002. • L.Padgham, L.Winikoff, <u>Developing Intelligent Agent Systems – A Practical Guide</u>, John Wiley and Sons, 2004. • H. Van Dyke Parunak, <u>Practical and Industrial Applications of Agent-Based Systems</u>,

MATA KULIAH/ COURSE TITLE	TE091579: Topik Khusus Teknik Sistem Pengaturan TE091579: <i>Special Topics in Control System Eng.</i> Credits: 2 Semester: VII (Pilihan/Optional)
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberikan pengetahuan tentang perkembangan terbaru yang berkaitan dengan ilmu kontrol <i>Provide knowledge about the latest developments relating to the science of control</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu mengikuti perkembangan terbaru ilmu kontrol • <i>Students are able to follow the latest developments of control science</i>
POKOK BAHASAN/ SUBJECTS	
PUSTAKA UTAMA/ REFERENCES	

MATA KULIAH/ COURSE TITLE	TE091481: Sistem dan Sinyal Multimedia TE091481: Multimedia System and Signal Credits: 4 Semester: V
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan Sistem dan sinyal multimedia beserta aplikasinya <i>Students know and be able to explain multimedia signal and system and its application</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep dan teknik-teknik pada Sistem dan sinyal multimedia. • Mahasiswa mampu melakukan simulasi konsep tersebut pada aplikasi yang sebenarnya • <i>Students are able to explain concepts and techniques in Multimedia signal and system</i> • <i>Students are able to simulate these concepts in real applications</i>
POKOK BAHASAN/ SUBJECTS	• Sistem kompresi lossless dan lossy • Pengkodean wavelet • Standar image coding • Standar video coding • Standar audio coding • <i>Lossless and lossy compression system</i> • <i>Wavelet encoding</i> • <i>Image coding standard</i> • <i>Video coding standard</i> • <i>Audio coding standard</i>
PUSTAKA UTAMA/ REFERENCES	• Ze-Nian Li , Mark S Drew, <u>Fundamentals of Multimedia</u>, Pearson, 2004 • Ralf Steinmetz, Klara Nahrsted, <u>Multimedia: Computing, Communications and Applications</u>, Prentice Hall • KR Rao, Zoran S. Bojkovic, Dragorad A Milovanovic, <u>Multimedia Communication Systems: Techniques, Standards, and Networks</u>, Prentice Hall 2002

MATA KULIAH/ COURSE TITLE	TE091483: Int. Manusia-Komp. & Rek. Per. Lunak TE091483: Human-Comp. Interact. & Software Eng. Credits: 4 Semester: V
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan peran IMK dalam rekayasa perangkat lunak beserta aplikasinya Students know and be able to explain the role of IMK in software engineering and its application
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan hubungan antara manusia dan komputer. • Mahasiswa mampu melakukan prototyping antarmuka GUI dengan prinsip-prinsip usability. • <i>Students are able to explain the relationship between humans and computers.</i> • <i>Students are able to do GUI interface prototyping with usability principles.</i>
POKOK BAHASAN/ SUBJECTS	• HCI: Human Factor, Computer Paradigm, Interaction Style • Usability • TCUID (Task Centered User Interface Design) • GUI Visual Programming
PUSTAKA UTAMA/ REFERENCES	• Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, <u>Human-Computer Interaction</u>, 3rd Edition, Prentice Hall; December 20, 2003 • Andrew Sears and Julie A. Jacko, <u>The Human-Computer Interaction Handbook Fundamentals, Evolving Technologies, and Emerging Applications</u>, Second Edition,. • Jeff Johnson, <u>GUI Bloopers 2.0, Common User Interface Design Don'ts and Dos</u>, ELSEVIER

MATA KULIAH/ COURSE TITLE	TE091485: Jaringan Komp. & Komputasi Bergerak TE091485: <i>Comp. Networks & Mobile Computing</i> Credits: 4 Semester: V
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu menjelaskan bagaimana sebuah jaringan computer terhubung dan saling berkomunikasi satu dengan lainnya dengan menggunakan protocol komunikasi, serta konsep-konsep komunikasi data yang ada di dalamnya termasuk adalah error correction dan security. <i>Students are able to explain how a computer network is connected and mutually communicate with each other using communication protocols, and concepts of data communications is in it, including the error correction and security.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan bagaimana dasar fondasi terjadinya komunikasi data dalam jaringan komputer • Mahasiswa mampu menjelaskan bagaimana logika-logika komunikasi data dan lingkungannya dibangun • <i>Students are able to explain how the basic foundation of data communication in computer networks</i> • <i>Students are able to explain how the logic of data communications and environment built</i>
POKOK BAHASAN/ SUBJECTS	• Dasar jaringan komputer • OSI reference model • Protocol TCP/IP • Logika komunikasi data • Konsep security dan kriptografi • <i>Basic computer network</i> • <i>OSI reference model</i> • <i>TCP / IP Protocol</i> • <i>Logic data communication</i> • <i>The concept of security and kriptografi</i>
PUSTAKA UTAMA/ REFERENCES	• James F Kurose dan Keith W Ross, Computer Networking Top Down, 2000

MATA KULIAH/ COURSE TITLE	TE091487: Struktur Data dan Komputasi Lunak TE091487: <i>Data Structure and Soft Computing</i> Credits: 4 Semester: V
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	• Siswa dapat mampu memahami konsep & struktur komputasi biologis • Siswa dapat menggambarkan dan mengamati prinsip komputasi biologis • <i>Student can be able to understand the concept & structure of the biological inspired computation</i> • <i>Student can describe and examines the principle of the biological inspired computation</i>
KOMPETENSI/ COMPETENCY	• Siswa dapat mengembangkan & mengimplementasikan perangkat lunak sederhana komputasi biologis untuk bidang komputer & informatic masalah melalui simulasi sederhana • <i>Student can develope & implement the simple software of the biological inspired computation to the field of computer & informatic problems through a simple simulation</i>
POKOK BAHASAN/ SUBJECTS	• <i>Foundation of Artificial Neural Networks: basic concepts of neural networks, supervised learning algorithm: single-layer and multilayer perceptrons, & unsupervised learning algorithm: self-organizing maps Hopfield, ART, etc. Hybrid learning, others neural model.</i> • <i>Data Structure: Linear data structure: list, stack, queue; Non linear data structure: tree, graph; sorting and searching methods</i> • <i>Fundamental of Fuzzy Logic: Topics covered include fuzzy set theory, fuzzy systems, membership function, rule base and inference engine development</i> • <i>Introduction to Evolutionary Algorithm: genetic algorithm, genetic programming, ant colony method, particle swarm optimization, artificial immune system.</i> • <i>Hybrid Algorithm: neuro-fuzzy, neuro-ga, fuzzy-ga, immune-evolutionary, etc .</i>
PUSTAKA UTAMA/ REFERENCES	• Jang JSR., <u>Neuro Fuzzy & Soft Computing</u>, Prentice Hall, 1997 • Purnomo,MH, <u>Supervised Learning Neural Networks</u>, Graha Ilmu. 2006. • Russel Norvig, <u>Artificial Intelligence A Modern Approach</u>, Prentice Hall, 2003

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- Cormen T., Leiserson C., Rivest R., Stein C., Introduction to Algorithms, 2nd Edition, Mc Graw Hill international Edition, 2004.
 - Haykin, Neural Networks, 1999
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MATA KULIAH/ COURSE TITLE	TE091490: Grafika Komputer dan Teknik Visualisasi TE091490: Computer Graphics & Vizualization Tech. Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memahami algoritma-algoritma pada grafika komputer. <i>Students understand the algorithms in computer graphics.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep grafika komputer. • Mahasiswa mampu melakukan implementasi algoritma-algoritma pada grafika komputer. • <i>Students are able to explain the concept of computer graphics.</i> • <i>Students are able to implement these algorithms in computer graphics.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep Komputer grafik • Perangkat keras dan perangkat lunak pada komputer grafik • Konsep garis, primitive dan obyek-obyek pada komputer grafik. • Konsep Matrix Transformasi • Interaksi manusia dengan komputer pada komputer grafik. • <i>Computer graphics concept</i> • <i>Computer hardware and software on the computer graphics</i> • <i>The concepts of lines, primitive and objects in computer graphics</i> • <i>Matrix Transformation concepts</i> • <i>Human interaction with computer on the computer graphics.</i>
PUSTAKA UTAMA/ REFERENCES	• Steven Harrington, <u>Computer Graphics A Programming Approach</u> Second Edition, McGraw-Hill International Editions 1987. • Max K. Agoston, MA, MS, PhD, <u>Computer Graphics and Geometric Modeling Implementation and Algorithms</u>, Springer-Verlag London 2005 • David Salomon, <u>Transformation And Projections In Computer Graphic</u>, Springer-Verlag London 2006. • John Vince, <u>Mathematics For Computer Graphic</u>, Springer-Verlag London 2006.

MATA KULIAH/ COURSE TITLE	TE091491: Pengolahan Multimedia dan Lab. TE091491: <i>Multimedia Processing and Lab.</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberikan pengetahuan tentang citra dan video digital, mulai dari akuisisi, penyimpanan, pemampatan, pengiriman, dan pengolahannya seperti perbaikan, restorasi, serta segmentasi, deskripsi, representasi, klasifikasi, pengenalan, dan visualisasi objek dari citra atau video digital. <i>Provide knowledge about digital images and video, from acquisition, storage, compression, transmission, and processing such as enhancement, restoration, and segmentation, description, representation, classification, recognition, and visualization objects from digital images or video</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mengetahui lingkup pengolahan citra dan video digital. • Mahasiswa mengetahui teknik dan metode akuisisi citra dan video digital dan peralatan akuisisinya. • Mahasiswa memahami teknik dan metode penyimpanan, dan pemampatan citra dan video digital. • Mahasiswa memahami teknik dan metode perbaikan, restorasi, dan representasi citra dan video digital. • Mahasiswa mengetahui penerapan satu atau kombinasi beberapa teknik atau metode untuk aplikasi tertentu. <i>Students know the scope of digital image and video processing.</i> <i>Students learn techniques and methods of digital image and video acquisition and acquisition equipments.</i> <i>Students understand the techniques and methods of storage, digital image and video compression</i> <i>Students understand the techniques and methods of enhancement, restoration, and the representation of digital images and video.</i> <i>Students learn the application of one or a combination of several techniques or methods for a particular application.</i>
POKOK BAHASAN/ SUBJECTS	• Teori tentang sinyal dan transformasinya, multiresolution, wavelet, dan mathematical morphology. • Pokok bahasan tentang citra dan video digital mencakup teknik dan metode akuisisi, perbaikan kualitasnya dan restorasi, representasi, dan pemampatan citra (lossy dan lossless). Pokok bahasan juga mencakup teknik dan metode segmentasi objek pada

	citra untuk proses lebih lanjut seperti registrasi, pencocokan (matching) serta pengenalan. • <i>The theory of signal and its transformation, multiresolution, wavelets and mathematical morphology.</i> • <i>The subject of the digital image and video include techniques and methods of acquisition, quality improvement and restoration, representation, and image compression (lossy and lossless). The subject also covers techniques and methods of objects segmentation in image for further processing such as registration, matching and the introduction.</i>
PUSTAKA UTAMA/ REFERENCES	• Alan C. Bovik, <u>Handbook of Image and Video Processing</u>, Academic Press, 2000 • Rafael C. Gonzalez, <u>Digital Image Processing</u>, 3rd Ed., Pearson Education, 2008 • Rafael C. Gonzalez, <u>Digital Image Processing using Matlab</u>, Pearson Education, 2003

MATA KULIAH/ COURSE TITLE	TE091492: Sistem Operasi Jaringan TE091492: <i>Network Operating System</i> Credits: 4 Semester: VI
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan elemen-elemen dalam Sistem Operasi beserta cara kerjanya <i>Students know and be able to explain the elements in the operating system and how it works.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan elemen-elemen pendukung dalam system operasi. • Mahasiswa mampu menjelaskan fungsi-fungsi elemen pendukung dalam system operasi. • <i>Students are able to explain the supporting elements in the operating system.</i> • <i>Students are able to explain the functions of supporting elements in the operating system.</i>
POKOK BAHASAN/ SUBJECTS	• Manajemen proses • Manajemen memori • Manajemen M/K • Jaringan dalam Sistem Operasi • Sekuriti • <i>Process management</i> • <i>Memory management</i> • <i>M/K Management</i> • <i>Operating System Network</i> • <i>Security</i>
PUSTAKA UTAMA/ REFERENCES	• Tanenbaum, Andrew, S., <u>Modern Operating System</u>, Prentice-Hall • William-stallings, <u>Operating Systems: Internals and Design Principles</u>, 6th-edition, Prentice-Hall

MATA KULIAH/ COURSE TITLE	TE091489: Sistem Embedded dan Lab. TE091489: <i>Embedded System and Lab.</i> Credits: 4 Semester: VI
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan sistem digital yang meliputi pengenalan dan pemahaman mesin-mesin digital, rangkaian aritmatika dan struktur pemrosesan signal digital pada sistem embedded <i>Students know and be able to describe a digital system that includes recognition and understanding of digital machines, arithmetic circuits and digital signal processing structures on embeded system.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep system Embedded. • Mahasiswa mampu melakukan simulasi da implementasi konsep embedded pada perangkat embedded. • <i>Students are able to explain the concepts of embeded</i> • <i>Students are able to simulate in implementing the concept embeded in embeded devices.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep Sistem Embedded • Teknologi VLSI dan Pemrograman sistem embedded. • Rangkaian Digital Aritmatik • Algoritma DSP • Manajemen perancangan sistem embeded • <i>The concept of embeded system</i> • <i>VLSI technology and embeded system programming</i> • <i>Digital arithmetic circuits</i> • <i>DSP algorithms</i> • <i>Embeded system design management</i>
PUSTAKA UTAMA/ REFERENCES	• K.C. Chang, <u>Digital System Design with VHDL and Synthesis</u>, Computer Society, 1999. • Lars Wanhammar, <u>DSP Integrated Circuits</u>, Academic Press, 1999 • Arnold S. Berger, <u>Embeded Systems Design an Introduction to Proces, Tools, and Techniques</u>, CMPBooks, 2002. • Ricard F. Tinder, <u>Digital Engineering Design A Modern Approach</u>, Prentice-Hall International Ed, London, 1991. • Brown, Vranesic, <u>Fundamentals Of Digital Logic with VHDL Design</u>, McGraw-Hill International Ed, Singapore, 2005.

MATA KULIAH/ COURSE TITLE	TE091493: Visi Komputer dan Pengukuran TE091493: <i>Computer Vision and Measurement</i> Credits: 4 Semester: VII
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mampu memahami konsep dasar visi komputer. <i>Students are able to understand the basic cooncepts of computer vision.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep visi komputer. • Mahasiswa mampu melakukan implementasi algoritma-algoritma pada visi komputer. • <i>Students are able to explain the concept of computer vision</i> • <i>Students are able to implement these algorithm in computer vision</i>
POKOK BAHASAN/ SUBJECTS	• Dasar Visi komputer • Model Citra • Pandangan Stereo • Epipolar Geometri • Rekonstruksi 3D • <i>Basic Computer Vision</i> • <i>Image model</i> • <i>Stereo vision</i> • <i>Epipolar geometry</i> • <i>3D reconstruction</i>
PUSTAKA UTAMA/ REFERENCES	• Forysh,Ponce, <u>Computer Vision Modern Approach</u>, Prentice Hall 2003 • Nikos Paragios, Yunmey Chen, <u>Handbook Of Mathematical Model in Computer Vision</u>, Springer,2006 • Steven Harrington, <u>Computer Graphics A Programming Approach</u>, Second Edition, McGraw-Hill International Editions1987. • Max K. Agoston, MA, MS, PhD, <u>Computer Graphics and Geometric Modeling Implementation and Algorithms</u>, Springer-Verlag London 2005

MATA KULIAH/ COURSE TITLE	TE091494: Sistem Manajemen Basis Data dan Lab. TE091494: Database Management System and Lab. Credits: 4 Semester: VII
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberikan pengetahuan tentang konsep sistem manajemen basis data (DBMS) dan komponen- komponennya. Disamping itu, memberikan informasi perkembangan terkini dari DBMS seperti basis data terdistribusi, basis data bergerak, basis data spasial, basis data fuzzy, basis data stream, basis data semi terstruktur, dan basis data multimedia terdistribusi, serta peran basis data dalam datawarehouse dan penambangan data (data mining). <i>Provide knowledge about the concept of database management systems (DBMS) and its components. In addition, the latest development information from the DBMS as a distributed database, mobile database, spatial database, fuzzy database, stream database, semi-structured databases, and distributed multimedia databases, and database role in datawarehouse and data mining (data mining).</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mengetahui perbedaan antara sistem file dan DBMS • Mahasiswa mengetahui komponen- komponen penyusun DBMS. • Mahasiswa menguasai perintah SQL untuk pendefinisian dan pengolahan data. • Mahasiswa mampu membentuk sebuah database melalui proses normalisasi • Mahasiswa mampu membentuk sebuah database dari diagram E-R. • Mahasiswa mengetahui aplikasi terkini dari DBMS seperti basis data terdistribusi, basis data bergerak, basis data spasial, basis data fuzzy, basis data stream, basis data semi terstruktur, dan basis data multimedia terdistribusi, serta peran basis data dalam datawarehouse dan penambangan data (data mining). • <i>Students know the difference between the file system and DBMS</i> • <i>Students know the constituent components of the DBMS</i> • <i>Students master the SQL commands for defining and processing data</i> • <i>Students are able to form a database through a process of normalization</i> • <i>Students are able to form a database from an ER diagram.</i> • <i>Students learn the latest applications of DBMS such as distributed databases, mobile databases, spatial databases, fuzzy database,</i>

	<i>stream database, semi-structured databases, and distributed multimedia databases, and database role in datawarehouse and data mining (data mining).</i>
POKOK BAHASAN/ SUBJECTS	• Sistem file dan DBMS, model database (hirarki, jaringan, dan relational), diagram E-R, query relational, integrity dan security, desain database relasional (dependency, integrity, bentuk normal, normalisasi, dan dekomposisi). • Komponen DBMS, penyimpanan, struktur file, dan organisasi, dan indexing. Pemrosesan query, optimisasi query, manajemen transaksi, kontrol konkuren, dan sistem recovery. • Basis data terdistribusi, basis data bergerak, basis data spasial, basis data fuzzy, basis data stream, basis data semi terstruktur, dan basis data multimedia terdistribusi, serta peran basis data dalam datawarehouse dan penambangan data (data mining). • <i>File System and the DBMS, database models (hierarchical, network, and relational), ER diagrams, relational queries, integrity and security, relational database design (dependency, integrity, normal form, normalization, and decomposition.</i> • <i>Component DBMS, storage, file structure, and organization, and indexing. Query processing, query optimization, transaction management, concurrent control, and system recovery.</i> • <i>distributed database, mobile database, spatial database, fuzzy database, stream database, semi-structured databases, and distributed multimedia databases, and database role in datawarehouse and data mining (data mining).</i>
PUSTAKA UTAMA/ REFERENCES	• Silberschatz, Korth, Sudarshan, <u>Database System Concept</u>, Fifth Edition, McGraw-Hill, 2006. • Raghu Ramakrisnan, <u>Database Management Systems</u>, Second Edition, McGraw-Hill, 2006.

MATA KULIAH/ COURSE TITLE	TE091580: Penambangan Data TE091580: Data Mining Credits: 4 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Memberikan pengetahuan tentang lingkup dan latar belakang penambangan data dan jenis data yang bisa ditambang. Disamping itu memberikan pemahaman tentang pola data yang bisa ditambang seperti pola kerap, asosiasi dan korelasi, klasifikasi, prediksi, klastering, dan pola pada berbagai aplikasi seperti data stream, data sekuen, data WEB. <i>Provide knowledge about the scope and background of data mining and data types that can be mined. Besides that provide insight into patterns of data that can be mined as frequent patterns, association and correlation, classification, prediction, clustering, and patterns in various applications such as data streams, data sequences, WEB data.</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mengetahui lingkup dan latar belakang penambangan data, jenis data dan pola data yang bisa ditambang. • Mahasiswa mengetahui peran datawarehouse dan teknologi OLAP dalam penambangan data. • Mahasiswa mengetahui pola umum seperti summarization, pola kerap, dan pola dari data stream, time series, data sekuen, data spasial, data multimedia, data teks, data WEB. • Mahasiswa memahami teknik klasifikasi untuk penambangan data seperti decision trees (classification tree & regression tree), analisis diskriminan, k-Nearest Neighbor, dan neural network. • Mahasiswa memahami teknik prediksi untuk penambangan data seperti loss functions, model linear dan non-linear. <i>Students know the scope and background of data mining, data types and data patterns that can be mined.</i> <i>Students know the role of the datawarehouse and OLAP technology in data mining.</i> <i>Students know the general patterns such as summarization, frequent pattern, and patterns from data streams, time series, sequence data, spatial data, multimedia data, text data, data WEB.</i> <i>Students understand the classification techniques for data mining such as decision trees (tree classification & regression tree), discriminant analysis, k-Nearest Neighbor, and the neural network.</i>

	• <i>Students understand the predictive techniques for data mining such as loss functions, linear models and non-linear.</i>
POKOK BAHASAN/ SUBJECTS	• Lingkup dan latar belakang penambangan data dan jenis data yang bisa ditambang • Berbagai teknik dalam penambangan data yang mencakup asosiasi dan korelasi, klasifikasi, prediksi, klastering, dan teknik untuk mendapatkan pola kerap, serta teknik untuk mendapatkan pola pada berbagai aplikasi seperti data stream, data sekuen, data WEB. • <i>Scope and background of data mining and data types that can be mined</i> • <i>Various data mining techniques including association and correlation, classification, prediction, klastering, and techniques for frequent patterns, and techniques to get the pattern in various applications such as data streams, data sequences, WEB data.</i>
PUSTAKA UTAMA/ REFERENCES	• Jiawei Han and Micheline Kamber, <u>Data Mining: Concepts and Techniques</u>, Morgan Kaufmann, Second Edition, 2006. • Ian H.Witten and Eibe Frank, <u>Data Mining: Practical Machine Learning Tools and Techniques</u>, Morgan Kaufmann, Second Edition, 2005. • Nong Ye, The <u>Handbook of Data Mining</u>, Lawrence Erlbaum Associates, Inc., 2003.

MATA KULIAH/ COURSE TITLE	TE091581: Temu Kembali Inform. Berbasis Konten TE091581: Content Based Information Retrieval Credits: 4 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan pengembangan Temu Kembali Informasi beserta konsep aplikasinya <i>Students know and are able to explain the devolepment of Gathering Information Return application along with the concept of</i>
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KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep dasar Temu Kembali Informasi untuk mendukung bidang-bidang sebelumnya terutama dalam aplikasinya di WEB. • Mahasiswa mampu melakukan simulasi konsep tersebut pada aplikasi mesin pencari WEB yang sebenarnya • <i>Students are able to explain the basic concepts Information retrieval to support the previous fields, especially in the WEB application</i> • <i>Students are able to simulate the application of the concept of WEB search engine</i>
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POKOK BAHASAN/ SUBJECTS	• Temu Kembali Informasi • Temu Kembali Informasi berbasis Konten untuk WEB • Implementasi Temu Kembali Informasi berbasis Konten menggunakan Jaringan syaraf Tiruan • <i>Information retrieval</i> • <i>Information retrieval content based for web</i> • <i>The implemantion of information retrieval content based using artificial neural network</i>
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PUSTAKA UTAMA/ REFERENCES	• Masoud Mohammadian, <u>Intelligent Agents for Data Mining and Information Retrieval</u>, Idea Group Publishing © 2004 • Michael W. Berry, <u>Survey of Text Mining. Clustering, Classification, and Retrieval</u>, Editor Springer-Verlag - 2004 • Callan, J., Lu, Z., & Croft, W. B. (1995). <u>Searching Distributed Collections with Inference Networks. The 19th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval</u>, Seattle, Washington (pp. 21–28). • Gravano, L. & Garcia-Molina, H. (1995). <u>Generalizing GLOSS to Vectorspace Databases and Broker Hierarchies</u>. Stanford, CA:
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Stanford University, Computer Science Department. (Technical Report)

- Lam, K. & Yu, C. (1982). A Clustered Search Algorithm Incorporating Arbitrary Term Dependencies, ACM Transactions on Database Systems, 500–508.

MATA KULIAH/ COURSE TITLE	TE091582: Biometrika TE091582: <i>Biometrics</i> Credits: 4 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa memiliki pengetahuan tentang teknik biometrika baik dalam system yang menggunakan single ataupun multi modal juga proses kegagalan dalam mendidentifikasi kasus dan bagaimana cara memecahkannya menggunakan ROC curve <i>Students have knowledge of both techniques in biometric system using single or multi-capital also identify process in case of failure and how to solve it using the ROC curve</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan cara-cara perancangan teknik biometrika baik single maupun multi modal. • Mahasiswa mampu menjelaskan proses kegagalan pada identifikasi teknik biometrika dan bagaimana cara mengurangi kegagalan tsb • <i>Students are able to explain the ways the design of both single biometric techniques and multi-capital.</i> • <i>Students can explain the failure of the identification process biometrika techniques and how to reduce the failure</i>
POKOK BAHASAN/ SUBJECTS	• Teknik-teknik biometrika, • Pengidentifikasian single ataupun multi modal. • Kegagalan pada teknik identifikasi biometrika dan penanggulangannya • Pengaturan kurva ROC • <i>biometric techniques,</i> • <i>The identification of single or multi-modal.</i> • <i>Failure to identify the techniques and the handling biometrika</i> • <i>Setting the ROC curve</i>
PUSTAKA UTAMA/ REFERENCES	• Anil K. Jain, Patrick Flynn, Arun A. Ross, <u>Handbook of Biometrics</u>, Springer Verlag 2005 • M. Negin, T. A. Chmielewski, M. Salganicoff, T. A. Camus, U. M. C. von Seelan, P. L. Venetianer, and G. G. Zhang. <u>An Iris Biometric System for Public and Personal Use</u>. IEEE Computer, 33(2):70–75, February 2000. • M. S. Nixon, J. N. Carter, D. Cunado, P. S. Huang, and S. V. Stevenage. Automatic Gait Recognition. In A. K. Jain, R. Bolle, and

S. Pankanti, editors, Biometrics: Personal Identification in Networked Society, pages 231–249. Kluwer Academic Publishers, London, UK, 1999.

- L. O’Gorman. Comparing Passwords, Tokens, and Biometrics for User Authentication. Proceedings of the IEEE, 91(12):2019–2040, December 2003.
- P. J. Phillips, P. Grother, R. J. Micheals, D. M. Blackburn, E. Tabassi, and J. M. Bone. FRVT2002: Overview and Summary. <http://www.frvt.org/FRVT2002>, March 2003.

MATA KULIAH/ COURSE TITLE	TE091583: Multimedia Ubiquitos TE091583: Ubiquitos Multimedia Credits: 4 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan pengembangan dunia ubiquitous multimedia beserta konsep aplikasinya <i>Students know and are able to explain the devolepment of multimedia ubiquitous world and its concept applications</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep dasar ubiquitous multimedia. • Mahasiswa mampu melakukan simulasi konsep tersebut pada aplikasi yang sebenarnya • <i>Students can explain the basic concept of ubiquitous multimedia.</i> • <i>Students are able to simulate these concepts in real applications</i>
POKOK BAHASAN/ SUBJECTS	• Komputasi Ubiquitous dan pervasive • Ubiquitous multimedia – sematic web. • Contoh implementasi pada Intelligent Traffic Simulation (ITS) • Activity oriented computation • <i>Ubiquitous computing and pervasive</i> • <i>Ubiquitous Multimedia - sematic web.</i> • <i>Example implementation of Intelligent Traffic Simulation (ITS)</i> • <i>Activity oriented Computation</i>
PUSTAKA UTAMA/ REFERENCES	• Soraya Kouadri Mostefaoui, <u>Advances in Ubiquitous Computing: Future Paradigms and Directions</u>, IGI Publishing, New York, 2008 • Toye E., Sharp R., Madhavapeddy A., Scott D., Upton E., & Blackwell A. (2007), <u>Interacting with Mobile Services: an Evaluation of Camera-phones and Visual Tags</u>, <u>Personal Ubiquitous Computing</u>, 11(2), 97-106, Springer-Verlag. • Toye, E., Sharp, R., Madhavapeddy, A., & Scott, D. (2005). <u>Using smart phones to access site-specific services</u>, <u>IEEE Pervasive Computing</u>, 4(2), 60-66. • Weinstein, R. (2005). <u>RFID: a Technical Overview and its Application to the Enterprise</u>, <u>IT Professional</u>, 7(3), 27- 33, IEEE Press. Weiser, M. (1991). The Computer for the 21st Century. <u>Scientific American</u>, 3,94-104.

MATA KULIAH/ COURSE TITLE	TE091584: Prosesor Multimedia TE091584: <i>Multimedia Processors</i> Credits: 4 Semester: Pilihan
TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Mahasiswa mengetahui dan mampu menjelaskan struktur Filter dalam Pengolahan data multimedia <i>Students know and are able to explain the structure of the filter in multimedia data processing</i>
KOMPETENSI/ COMPETENCY	• Mahasiswa mampu menjelaskan konsep Digital Sinyal Processor. • Mahasiswa mampu melakukan simulasi dan implementasi konsep Multimedia Sinyal Processor. • <i>Students are able to explain the concept of Digital Signal Processor.</i> • <i>Students are able to simulate in the implementation of the concept of Multimedia Signal Processor.</i>
POKOK BAHASAN/ SUBJECTS	• Konsep Digital Sinyal Processor • Teknologi Multimedia. • Pengolahan Data Multimedia • Filter • Algoritma DSP • <i>The concept of Digital Signal Processor</i> • <i>Technology Multimedia.</i> • <i>Multimedia Data Processing</i> • <i>Filter</i> • <i>DSP Algorithms</i>
PUSTAKA UTAMA/ REFERENCES	• Lars Wanhammar, <u>DSP Integrated Circuits</u>, Academic Press, 1999 • Al Bovik, <u>Handbook of Image and Video Processing</u>, Academic Press, 2000. • Rafael C. Gonzalez, <u>Digital Image Processing</u>, Prentice Hall, 2002.

MATA KULIAH/ COURSE TITLE	TE091585: Komputasi Grid TE091585: <i>Grid Computing</i> Credits: 4 Semester: Pilihan
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TUJUAN PEMBELAJARAN/ LEARNING OBJECTIVES	Siswa dapat menjelaskan arsitektur dasar sistem Grid, sistem manajemen sumber daya dalam Grid, dan juga bagaimana web semantik yang digunakan dalam sistem Grid untuk memberikan keamanan dan keandalan dari Grid <i>Student can explain the basic architecture of Grid system, resources management system in Grid, and also how is the semantic web being deployed in Grid system to provide the security and reliability of the Grid</i>
KOMPETENSI/ COMPETENCY	1. Siswa dapat menjelaskan arsitektur dasar dan fitur Grid berdasarkan standarisasi OGSA 2. Siswa dapat menjelaskan bagaimana sistem pengelolaan sumber daya diterapkan dalam sistem Grid untuk mendukung kinerja dan keamanan di Grid 1. <i>Student can explain the basic architecture and features of Grid based on OGSA standardization</i> 2. <i>Student can explain how the resources management system is applied in Grid system to support the performance and security in Grid</i>
POKOK BAHASAN/ SUBJECTS	1. Arsitektur Dasar Sistem Grid 2. konsep aplikasi dalam komputasi terdistribusi 3. Globus toolkit dan layanan web di sistem grid 4. Semantic web sistem grid 5. Konsep keamanan dan kinerja dalam sistem grid 1. <i>The Basic architecture of Grid System</i> 2. <i>Some concepts of application in distributed computing</i> 3. <i>Globus toolkit and web service in grid system</i> 4. <i>Web Semantic grid system</i> 5. <i>The concept of security and performance in grid system</i>
PUSTAKA UTAMA/	1. Maozhen Li and Mark Baker, "The Grid core technology", Brunel Univ, UK, Portsmouth Univ, USA, John Wiley & Sons, 2005

REFERENCES
