



INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS
DEPARTEMEN TEKNIK ELEKTRO
Program Studi Magister (S2) Teknik Elektro

1	Nama Mata Kuliah / <i>Course Name</i>	: Sistem Komunikasi Digital / <i>Digital Communication System</i>
2	Course Code	: EE255231
3	Kredit / Credits	: 3 SKS
4	Semester / Semester	: 2

Deskripsi Mata Kuliah / Course Description

Sistem Komunikasi Digital membahas tentang perancangan sistem transmisi sinyal pesan (data) dalam format digital menggunakan sinyal/ gelombang pembawa tunggal dengan tujuan agar sinyal pesan digital dapat dikirim melewati media transmisi (dengan gangguannya berupa interferensi dan filtering) dan gangguan berupa sinyal noise dan membahas perancangan teknik deteksi sinyal pesan kembali dengan kemungkinan error sekecil mungkin dengan memperhatikan kriteria perancangan yaitu daya dan bandwidth yang efisien serta kompleksitas perangkat yang rendah.

Digital Communication Systems discusses the design of a message signal (data) transmission system in digital format using a single carrier signal/wave with the aim that the digital message signal can be sent through the transmission media (with interference and filtering) and interference in the form of noise signals and discusses the design of a message signal detection technique with the smallest possible error by considering the design criteria, namely efficient power and bandwidth and low device complexity.

Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah / Program Learning Outcomes Charged to The Course

1. (CPL-02) Mampu mengembangkan dan memecahkan permasalahan ipteks dalam bidang keilmuannya melalui riset dengan pendekatan inter atau multidisiplin hingga menghasilkan karya inovatif dan teruji, serta mendapat pengakuan nasional dan internasional.

(PLO-02) Able to develop and solve science and technology problems in their scientific fields through research with an inter or multidisciplinary approach to produce innovative and tested work, and receive national and international recognition.

2. (CPL-04) Mampu menguasai konsep, prinsip keilmuan secara komprehensif, prinsip rekayasa, dan pengetahuan faktual tentang Teknologi Informasi untuk mengembangkan prosedur dan strategi yang diperlukan pada analisis dan perancangan sistem terkait bidang Teknik Elektro.

(PLO-04) Able to master concepts, scientific principles comprehensively, engineering principles, and factual knowledge about Information Technology to develop procedures and strategies required in the analysis and design of systems related to the field of Electrical Engineering.

3. (CPL-05) Mampu mengimplementasikan penyelesaian permasalahan rekayasa yang memperhatikan faktor-faktor ekonomi, kesehatan dan keselamatan publik, kultural, sosial dan lingkungan.

(PLO-05) Able to implement engineering problem solving that takes into account economic, public health and safety, cultural, social and environmental factors.

Capaian Pembelajaran Mata Kuliah / Course Learning Outcomes

1. Mampu memahami dan mendefinisikan konsep sistem komunikasi digital, mampu menerapkan konsep sinyal dan sistem dalam analisis sistem komunikasi digital serta mampu menjelaskan konsep pengubahan sinyal analog menjadi sinyal digital sinyal digital./ *Able to understand and define the concept of digital communication systems, able to apply the concept of signals and systems in digital communication system analysis and able to explain the concept of converting analog signals into digital signals.*
2. Mampu memahami konsep dasar penerima optimum untuk sistem komunikasi digital dan mampu memahami konsep ruang sinyal. / *Able to understand the basic concept of optimum receiver for digital communication systems and able to understand the concept of signal space.*
3. Mampu mengaplikasikan konsep ruang sinyal dalam perancangan pemancar dan penerima optimum untuk sistem modulasi digital biner dan m-ary, dan mampu menggunakan program matlab untuk simulasi dan analisis sistem modulasi digital. / *Able to apply the concept of signal space in designing optimum transmitters and receivers for binary and m-ary digital modulation systems, and able to use the Matlab program for simulation and analysis of digital modulation systems.*
4. Mampu merancang teknik pengiriman sinyal yang hemat bandwidth dengan pengkodean sumber. / *Able to design bandwidth-efficient signal delivery techniques with source coding.*
5. Mampu merancang bentuk spektrum dan pulsa sinyal modulasi digital linier sehingga dapat dioperasikan pada lingkungan terbatas bandwidth dan mampu merancang teknik ekualiser sederhana untuk mengatasi adanya distorsi inter-symbol-interference akibat kanal tak ideal. / *Able to design spectrum and pulse forms of linear digital modulation signals so that they can be operated in bandwidth-limited environments and able to design simple equalizer techniques to overcome inter-symbol-interference distortion due to non-ideal channels.*

Pokok Bahasan / Contents

1. Konsep sistem komunikasi digital, konsep sinyal dan sistem untuk analisis sistem komunikasi digital dan konsep pemformatan sinyal digital. Karakteristik dan parameter penting sinyal-sinyal yang digunakan pada sistem komunikasi digital. / *Concept of digital communication system, concept of signal and system for analysis of digital communication system and concept of digital signal formatting. Characteristics and important parameters of signals used in digital communication systems.*
2. Tinjau ulang konsep pemformatan sinyal analog menjadi sinyal digital dengan memperhatikan sinyal bandwidth digital dan meminimalkan distorsi dan kehilangan informasi. / *Review the concept of formatting analog signal into digital signal by considering digital bandwidth signal and minimizing distortion and information loss.*
3. Konsep penerima optimum: Matched filter dan korelator untuk sistem modulasi digital. / *Concept of optimum receiver: Matched filter and correlator for digital modulation system.*
4. Konsep ruang sinyal dan representasi set sinyal berdurasi terbatas, dan prosedur Gram-Schmidt untuk mendapatkan sinyal basis orthonormal. / *Concept of signal space and representation of finite duration signal set, and Gram-Schmidt procedure to obtain orthonormal basis signal.*

5. Konsep perancangan penerima koheren dan pemancar untuk sistem komunikasi digital biner. / *Concept of coherent receiver and transmitter design for binary digital communication system.*
6. Konsep simulasi dari sistem komunikasi digital biner menggunakan software Matlab. / *Concept of simulation of binary digital communication system using Matlab software.*
7. Konsep perancangan penerima koheren dan pemancar untuk sistem komunikasi digital M-ary. / *Concept of coherent receiver and transmitter design for M-ary digital communication system.*
8. Konsep simulasi dari sistem komunikasi digital M-ary menggunakan software Matlab. / *Concept of simulation of M-ary digital communication system using Matlab software.*
9. Konsep perancangan penerima non-koheren dan modifikasi pemancar modulasi digital tertentu seperti DPSK, D8PSK, OQPSK dengan tambahan teknik koding. / *Concept of non-coherent receiver design and modification of certain digital modulation transmitter such as DPSK, D8PSK, OQPSK with additional coding technique.*
10. Konsep perhitungan kinerja BER sistem komunikasi digital biner. / *Concept of BER performance calculation of binary digital communication system.*
11. Konsep perhitungan kinerja SER dan BER sistem komunikasi digital M-ary. / *Concept of SER and BER performance calculation of M-ary digital communication system.*
12. Konsep perhitungan rapat spektral sinyal modulasi linier dan teknik pulse-shaping. / *The concept of calculating the spectral density of linear modulation signals and pulse-shaping techniques.*
13. Teori Informasi dengan pengkodean sumber. / *Information Theory with source coding.*
14. Konsep perhitungan rapat spektral sinyal modulasi linier dan teknik koding. / *The concept of calculating the spectral density of linear modulation signals and coding techniques.*
15. Konsep pengiriman sinyal modulasi digital dengan bandwidth terbatas dan bebas inter-simbol interferensi (ISI) menggunakan filtering Nyquist dan konsep ekualisasi kanal untuk menurunkan ISI karena pengaruh kanal tak-ideal. / *The concept of sending digital modulation signals with limited bandwidth and free from inter-symbol interference (ISI) using Nyquist filtering and the concept of channel equalization to reduce ISI due to the influence of non-ideal channels.*

Prasyarat / Pre-requisite

Sinyal dan Sistem / *Signals and System*

Pustaka / Reference

Utama / *Primary:*

1. Bernard Sklar and Pabitra Kumar Ray, Digital communications: Fundamentals and Applications, 2nd Edition, PEARSON, 2014.
2. Hwei Hsu, Ph.D., Schaum's outline of theory and problems of Analog and Digital Communications, 2nd Edition, Mc-Graw Hill, 2003.
3. John G. Proakis, Digital communications, 3rd Edition, Mc-Graw Hall, 1995.

Pendukung / *Supporting:*

1. Tri T. Ha, Theory and Design of Digital Communication Systems, cambridge University Press, 2011.
2. Michel C. Jeruchim, Philip Balaban, and K. Sam Shanmugan. Simulation of communication systems: modeling, methodology and techniques, 2nd Edition, Kluwer Academic Publishers, New York, 2002.