INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS
DEPARTEMEN TEKNIK ELEKTRO
Program Studi Sarjana (S1) Teknik Telekomunikasi

1	Nama Mata Kuliah	:	Pengkodean Kanal
2	Kode Mata Kuliah	:	EL234714
3	Kredit	:	2 SKS
4	Semester	:	Pilihan

Deskripsi Mata Kuliah

Pengkodean kanal merupakan mata kuliah yang membahas tentang konsep, prinsip dan strategi pengiriman pesan secara digital dengan cara menambahkan sejumlah bit redundansi (paraty check) dan teknik pengkodean tertentu yang mempunyai kemampuan mendeteksi dan mengkoreksi error baik error bit tunggal maupun error burst yang terjadi saat sinyal pesan digital ditransmisikan melewati kanal transmisi.

Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah

1. (CPL-05) Mampu merancang komponen, sistem, dan proses yang logis dan realistis sesuai dengan spesifikasi yang ditentukan dengan mempertimbangkan aspek keselamatan, sosial, budaya, lingkungan, dan ekonomi.
2. (CPL-07) Mampu mengidentifikasi, memformulasikan, menganalisis, dan menyelesaikan permasalahan kompleks di bidang teknik telekomunikasi
3. (CPL-08) Mampu mengetahui dan mengaplikasi metode dan keahlian sesuai perkembangan terkini di bidang ilmu pengetahuan dan teknologi untuk menyelesaikan permasalahan di bidang Teknik Telekomunikasi dengan mengedepankan nilai-nilai universal

Capaian Pembelajaran Mata Kuliah

1. Mampu memahami pentingnya penerapan teknik pengkodean kanal dalam mengatasi permasalahan transmisi pesan dalam sistem komunikasi digital.
2. Mampu memahami dan mendefinisikan konsep aljabar koding dan aplikasinya pada disain pengkodean kanal.
3. Mampu memilih dan menerapkan strategi pengkodean kanal yang termasuk dalam kode blok,
4. Mampu memilih dan menerapkan strategi pengkodean kanal yang termasuk dalam konvolusional.
5. Mampu menganalisa dan membandingkan kinerja bit-error-rate sistem komunikasi digital sebelum dan sesudah penerapan teknik pengkodean kanal untuk kanal ideal dengan gangguan interferensi derau putih Gaussian.

Pokok Bahasan

1. Konsep dan teori dasar pengkodean kanal.
2. Konsep aljabar koding: Galois field orde prima, polynomial primitive, dan polinomial minimal.

3. Konsep pengkodean kanal : perhitungan syndrome, array standar dan pengkodean kode sederhana: kode repetisi dan kode Hamming.
4. Konsep pengkodean kanal : kode blok linier.
5. Konsep pengkodean kanal : kode siklik.
6. Konsep pengkodean kanal : modifikasi kode blok.
7. Konsep pengkodean kanal: kode konvolusional.
8. Konsep dekode kode konvolusional : Diagram trellis dan algorithma Viterbi.
9. Konsep perhitungan kinerja sistem komunikasi digital sebelum dan setelah penerapan pengkodean kanal.

Prasyarat

Sistem Komunikasi

Pustaka

Utama :

1. Shu Lin and Daniel J Costello, Jr, "Error Control Coding Fundamental and Application", Prentice-Hall Inc., 1983.
2. Stephen B Wicker, "Error Control Systems for Digital Communica-tion and Storage, Vol. 1. Englewood Cliffs: Prentice hall, 1995.
3. Hwei Hsu, Ph.D., Schaum's outline of theory and problems of Analog and Digital Communications, 2nd Edition, Mc-Graw Hill, 2003.

Pendukung :

1. Yuan Jiang, "A practical guide to error-control coding using Matlab". Artech House, 2010.
2. K Sam Shanmugam, Digital and Analog Communication Systems, John Wiley and Sons,1979.
3. Elwyn R Berlekamp, " Algebraic coding theory", World Scientific Publishing Co, 2015
4. Robert H Morelos-Zaragoza, "The art of error correcting coding", John Wiley & Sons, 2006.

1	Course Name	:	Channel Coding
2	Course Code	:	EL234714
3	Credit	:	2 SKS
4	Semester	:	Optional

Course Description

Channel coding is a course that discusses the concepts, principles, and strategies of transmitting messages digitally by adding a certain amount of redundancy bits (parity check) and specific encoding techniques that have the ability to detect and correct errors, both single-bit errors and burst errors that occur when digital message signals are transmitted through a transmission channel.

Learning Outcomes Imposed by Course Assignments

1. (CPL-05) Capable of designing components, systems, and processes that are logical and realistic according to specified specifications while considering safety, social, cultural, environmental, and economic aspects.
2. (CPL-07) Capable of identifying, formulating, analyzing, and solving complex problems in the field of telecommunications engineering.
3. (CPL-08) Capable of comprehending and applying methodologies and skills in accordance with the latest advancements in the field of science and technology to address issues in Telecommunication Engineering, while emphasizing universal values.

Course Learning Outcomes

1. Capable of understanding the significance of employing channel coding techniques to tackle message transmission challenges in digital communication systems.
2. Proficient in comprehending and defining the concept of coding algebra and its utilization in channel coding design.
3. Competent in selecting and executing channel coding strategies encompassed in block codes.
4. Competent in selecting and executing channel coding strategies encompassed in convolutional codes.
5. Skilled in analyzing and comparing the bit-error-rate performance of digital communication systems before and after applying channel coding techniques for an ideal channel with Gaussian white noise interference.

The Main Topic

1. Basic concepts and theory of channel coding.
2. Coding algebra concepts: prime order Galois field, primitive polynomial, and minimal polynomial.
3. Channel coding concepts: syndrome calculation, standard array, and simple code encoding: repetition code and Hamming code.

4. Channel coding concept: linear block code.

5. Channel coding concept: cyclic code.

6. Channel coding concept: block code modifications.

7. Channel coding concept: convolutional code.

8. Decoding concept of convolutional code: Trellis diagram and Viterbi algorithm.

9. Concepts of evaluating the performance of digital communication systems before and after the implementation of channel coding.

Prerequisites

Communication System

Bibliography

Primary References:

1. Shu Lin and Daniel J Costello, Jr, "Error Control Coding Fundamental and Application", Prentice-Hall Inc., 1983.
2. Stephen B Wicker, "Error Control Systems for Digital Communica-tion and Storage, Vol. 1. Englewood Cliffs: Prentice hall, 1995.
3. Hwei Hsu, Ph.D., Schaum's outline of theory and problems of Analog and Digital Communications, 2nd Edition, Mc-Graw Hill, 2003.

Support Reference :

1. Yuan Jiang, "A practical guide to error-control coding using Matlab". Artech House, 2010.
2. K Sam Shanmugam, Digital and Analog Communication Systems, John Wiley and Sons,1979.
3. Elwyn R Berlekamp, " Algebraic coding theory", World Scientific Publishing Co, 2015
4. Robert H Morelos-Zaragoza, "The art of error correcting coding", John Wiley & Sons, 2006.