EEE306 – COMMUNICATION SYSTEMS I

Course Code	Course Name		Semester	
EEE306	Communication Systems I		Fall ☐ Spring ☒ Summer ☐	
Hours			Credit	ECTS
Theory	Practice	Lab	4	5
3	0	2		

Course Details	
Department	Electrical and Electronics Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Lecturer(s)	Prof. Dr. Yalçın Ata
Course Objectives	Introduction to and overview of analog and digital communications. The fundamental physics and mathematics of communication, metrics and limitations of telecommunication systems. To provide students with a foundational understanding of analog and digital communication systems, including the principles, analysis, and design of communication techniques. This course aims to develop the ability to analyze communication signals and systems in the time and frequency domains, understand the impact of noise on system performance, and explore practical applications in modern communication technologies.
Course Content	The course covers the fundamentals of communication systems, including an introduction to analog and digital communication, signal analysis in time and frequency domains, and the principles of amplitude modulation (AM), angle modulation (FM and PM), and pulse modulation (PAM, PWM, PPM). It also includes the study of noise effects on communication systems, sampling theorem, quantization, pulse code modulation (PCM), and an introduction to digital data transmission. Additionally, the course explores communication channel characteristics, bandwidth requirements, and practical applications in real-world systems such as radio, television, and satellite communication.
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☐ Discussion ☐
Prerequisites/ Corequisites	

Work Placement(s)	-

Textbook/References/Materials

- Michael P. Fitz, Fundamentals of Communications Systems, McGraw-Hill, 2007.
- J.G. Proakis & Masoud Salehi, Fundamentals of Communication Systems (2edition), Pearson, 2014.
- Simon Haykin, Communication Systems, John Wiley&Sons, Inc, 2001.

Course Category				
Mathematics and Basic Sciences	☐		Education	☐
Engineering	☒		Science	☐
Engineering Design	☐		Health	☐
Social Sciences	☐		Profession	☐

Weekly Schedule

No	Topics	Materials/Notes
1	Introduction, Signal and Systems Review	Chapter 1&2 (Fitz)
2	Fourier Representations	Chapter 2 (Fitz)
3	Probability and Random Variables, Complex baseband representation	Chapter 3&4 (Fitz)
4	Analog Communication Basics, Analog Modulation and Performance Metrics, Amplitude Modulation	Chapter 5&6 (Fitz)
5	Amplitude Demodulation, Coherent and Envelope Detectors	Chapter 6 (Fitz)
6	Angle Modulation, Phase and Frequency Modulation Systems	Chapter 7 (Fitz)
7	Angle demodulation, phase-locked loops	Chapter 7&8 (Fitz)
8	Midterm Exam	
9	Noise in Communication Systems and Random Processes	Chapter 9&10&11 (Fitz)
10	Digital Modulation and Performance Metrics, Shannon's Limit	Chapter 12 (Fitz)
11	Digital Modulation Systems, ASK, PSK,	Chapter 7&8 (Proakis)
12	Digital Modulation Systems, FSK, QAM	Chapter 7&8 (Proakis)
13	Digital Modulation Systems, PCM, Delta modulation, M-ary Modulation Performance and Spectral Efficiency	Chapter 7&8 (Proakis)
14	Digital demodulation	Chapter 9 (Proakis)
15	Modulation and Multiplexing Techniques (FDM, TDM), Orthogonal Modulations	Chapter 8 & 15(Proakis)
16	Final Exam	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance		
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework	3	15
Presentation / Seminar		
Project		
Report		
Seminar		
Midterm Exam	2	45
Final Exam	1	40
	Total	**100%**
Contribution of Midterm Studies to Success Grade		60
Contribution of End of Semester Studies to Success Grade		40
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	16	3	48
Lab	16	2	32
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time			
Quiz/Studio/Criticize			
Homework	3	5	15
Presentation / Seminar			
Project			
Report			
Midterm Exam and Preparation for Midterm	2	15	30
Final Exam and Preparation for Final Exam	1	20	20
Total Workload			**145**
Total Workload / 25			**5.8**
ECTS Credit			**5**

Course Learning Outcomes	
No	**Outcome**
L1	learning analog communication systems
L2	learning basic digital communication systems
L3	differentiating analog and digital representation and transmission of information
L4	understanding the concept of "noise" in analog and digital communication systems
L5	understanding the trade-offs (in terms of bandwidth, power, and complexity requirements) between basic analog and digital communication systems
L6	being aware of design basic analog or digital communication systems
L7	utilizing the Fourier transform to analyze communication systems.
L8	using complex exponential notation to describe signals and systems and describing how signals are used in applications

Contribution of Course Learning Outcomes to Program Competencies/Outcomes

Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**					**Total**
L1	4	5	4	4	2	1	X	X	X	X	X					-
L2	4	5	4	4	2	1	X	X	X	X	X					-
L3	4	4	3	3	3	1	X	X	X	X	X					-
L4	4	4	4	4	2	1	X	X	X	X	X					-
L5	2	4	4	2	1	1	X	X	X	X	X					-
L6	3	3	4	4	2	1	X	X	X	X	X					-
L7	5	4	2	2	1	1	X	X	X	X	X					-
L8	3	3	2	2	1	1	X	X	X	X	X					-
															Total	-

i. Sufficient knowledge in the fields of mathematics, natural sciences, and related engineering disciplines; the ability to apply theoretical and practical knowledge in solving complex engineering problems.

ii. The ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.

iii. The ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.

iv. The ability to select and use modern techniques and tools required for the analysis and solution of complex problems encountered in engineering applications; the ability to effectively use information technologies.

v. The ability to design experiments, conduct experiments, collect data, analyze results, and interpret findings for the investigation of complex engineering problems or discipline-specific research topics.

vi. The ability to work effectively in intra-disciplinary and multidisciplinary teams; the ability to work independently.

vii. The ability to communicate effectively both orally and in writing; proficiency in at least one foreign language; the ability to write effective reports, understand written reports, prepare design and production reports, make effective presentations, and give and receive clear and understandable instructions.

viii. Awareness of the necessity of lifelong learning; the ability to access information, track developments in science and technology, and continuously renew oneself.

ix. Acting in accordance with ethical principles, knowledge of professional and ethical responsibilities, and the standards used in engineering applications.

x. Knowledge of business practices such as project management, risk management, and change management; awareness of entrepreneurship and innovation; knowledge of sustainable development.

xi. Knowledge of the impact of engineering practices on health, environment, and safety at global and societal levels, and awareness of contemporary engineering issues; awareness of the legal consequences of engineering solutions.