

SYLLABUS

1. **Course name:** Communication Systems
2. **Course code:** COSY330464E
3. **Credits:** 3 credits (3/0/6) (3 theoretical credits, 0 practical credit).
Duration: 15 weeks (3 main periods and 6 self-study periods)/week).
4. **Instructors:**
 - a. Primary instructor: Phan Van Ca, Ph.D
 - b. Secondary instructors:
 - Le Minh Thanh, M.Eng
 - Dang Phuoc Hai Trang, M.Eng.
5. **Course conditions:**
 - a. Prerequisites: N/A.
 - b. Corequisites: Signals and Systems.

6. Course Description:

This course provides background knowledge of digital and analog communication systems. This course content includes: analog, digital and pulse modulation systems; analysis signal constellation and evaluate modulation performance in noisy channel; design a basic communication system use mathematical model and simulation software.

7. Course Goals:

Goals	Goal description <i>This course provides students:</i>	ELOs
G1	Background knowledge and analytical methods used in communication systems; The concepts, techniques and components of communication systems; The relationship between signal, modulation and transmission techniques in analog and digital communication systems.	01 (H)
G2	Ability to analyze and evaluate the performance of a communication technique or system and ability to design a simple communication system.	02 (M)
G3	Ability to identify and describe different techniques in modern digital communication systems.	07 (M)
G4	Ability to use softwares to analyze and simulate simple communication systems	03 (L)

* Note: *H: High; M: Medium; L: Low*

8. Course Learning Outcomes - CLOs:

CLOs	Description <i>After completing this course, students can have:</i>	ELOs
G1	G1.1 Ability to present the signal roles, channel and interference in communication systems.	01, 07
	G1.2 Ability to use signal and system analysis methods in frequency and time domain related to communication systems.	01, 07
	G1.3 Ability to present analog modulation such as: AM, FM, PM ...	01, 07
	G1.4 Ability to represent digital signals using binary and multi-level line coding.	01, 07
	G1.5 Ability to present digital modulation such as: ASK, PSK, FSK, QAM ...	01, 07

	G1.6	Ability to present analog and digital multiplexing principles, circuit and packet switching.	01, 07
G2	G2.1	Ability to analyze communication systems according to required parameters.	02
G3	G3.1	Ability to analyze the relationship between digital and analog communication systems and the reasons for the outbreak of digital communications.	07
	G3.2	Ability to analyze the needs of baseband and passband communication systems.	07
	G3.3	Ability to evaluate new telecommunications technologies.	07
G4	G4.1	Ability to use Matlab software to analyze and design communication systems.	03

9. Study materials:

a. Textbooks:

- [1] R.E. Ziemer and W.H. Tranter, *Principles of communications: systems, modulation, and noise*, 6th ed. Wiley, 2009.

b. References:

- [2] Taub Schilling, *Principles of communication systems*, 2nd ed., Mc Graw Hill, 1999.
 [3] Simon Haykin and Michael Moher, *Communication Systems*, 5th ed., Wiley, March 2000.
 [4] Proakis and Salehi, *Fundamentals of communication systems*, 2nd ed., Pearson, 2013.

10. Student Assessments:

a. Grading points: 10

b. Planning for students assessment is followed::

Type	Contents	Line time	Assessment techniques	CLOs	Rates (%)
Midterms					50
H	Knowledge of chapters 1-3	Week 4 th	Homeworks	G1.1, G1.2, G3.1	5
H	Knowledge of chapters 8-9	Week 12 th	Homeworks	G1.4, G1.5	5
P	Use Matlab software to simulate communication systems.	Week 6 th -14 th	Use computer and reported.	G2.1, G2.2, G3.2, G3.3	10
M	Knowledge of chapters 1-7	Week 8 th	Individual paper test in class	G1.1, G1.2, G1.3, G1.6	30
Final exam					50
F	Content includes all output standards of the course.		Individual paper assessment in class		50

* Note: Q: Quiz; H: Homework; P: Project; M: Midterm Exam; F: Final Exam;

11. Course details:

Week	Contents	CLOs
1	<i>Chapter 1. Overview (3/0/6)</i>	
	Teaching contents: (3)	G1.1, G3.1,

	<p>1.1 Introduction to communication systems. 1.2 Concepts in communication systems. 1.3 Block diagram of communication systems. 1.4 Analysis techniques in communication systems.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 1.5 Organizations and standards related to communication systems 1.6 Some real communication systems</p>	G3.2, G3.3, G2.1, G2.2
2	Chapter 2. Signal and system theory (3/0/6)	
	<p>Teaching contents: (3) 2.1 Signal models and classification. 2.2 Fourier series and transform. 2.3 Correlation and power spectral density. 2.4 LTI system.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 2.5 Signal sampling theory. 2.6 Hilbert transform.</p>	G1.1, G3.1, G3.2, G3.3, G2.1, G2.2
3	Chapter 3. Channel (3/0/6)	
	<p>Teaching contents: (3) 3.1 Classification. 3.2 Characteristics 3.3 Bandwidth and attenuation. 3.4 Channel equation.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 3.5 Radio spectrum 3.6 Transmission law in free space.</p>	G1.2, G3.1, G3.2, G3.3, G2.1, G2.2
4	Chapter 4. Linear modulation (3/0/6)	
	<p>Teaching contents: (3) 4.1. Linear modulation 4.2. Frequency mix and shift. 4.3. Frequency mixer.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 4.4. AM radio system 4.5. Analog television system. 4.6. Noise in linear modulation</p>	G1.3, G3.1, G3.2, G3.3, G2.1, G2.2
5	Chapter 5. Angle modulation (3/0/6)	

	<p>Teaching contents: (3) 5.1. Angle modulation 5.2. PLL 5.3. Frequency synthesizer.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 5.4. Digital PLL 5.5. Frequency multiplier 5.6. Noise in angle modulation</p>	G1.3, G3.1, G3.2, G3.3, G2.1, G2.2
	Chapter 6. Pulse modulation (3/0/6)	
6	<p>Teaching contents: (3) 6.1. Analog pulse modulation. 6.2. PCM, DM and DPCM. 6.3. PCM system.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 6.4. Quantum noise. 6.5. Compression technique in PCM system.</p>	G1.3, G3.1, G3.2, G3.3, G2.1, G2.2
	Chapter 7. Multiplexing (3/0/6)	
7	<p>Teaching contents: (3) 7.1. FDM 7.2. TDM 7.3. Analog communication systems. 7.4. Digital communication systems.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 7.5. Orthogonal multiplexing. 7.6. Compare to multiplexing techniques.</p>	G1.6, G3.1, G3.2, G3.3, G2.1, G2.2
	Chapter 8. Switching (3/0/6)	
8	<p>Teaching contents: (3) 8.1. Circuit switching. 8.2. Packet switching. 8.3. Virtual circuit switching.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p> <hr/> <p>Self-study contents: (6) 8.4. Exchange structure. 8.5. Trunk. 8.6. R2 and CCS7 signaling..</p>	G1.6, G3.1, G3.2, G3.3, G2.1, G2.2
9	Chapter 9. Baseband transmission (3/0/6)	

	<p>Teaching contents: (3) 9.1. Baseband transmission system. 9.2. Line coding and power spectral density 9.3. ISI noise.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p>	G1.4, G3.1, G3.2, G3.3, G2.1, G2.2
	Self-study contents: (6) 9.4. Digital Multiplexing systems.	
	Chapter 9. Baseband transmission (continuos) (3/0/6)	
10	<p>Teaching contents: (3) 9.5. Pulse format. 9.6. Eye diagram. 9.7. Synchronous.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p>	G1.4, G3.1, G3.2, G3.3, G2.1, G2.2
	Self-study contents: (6) 9.8. ISI-suppressed balanced	
	Chapter10. Passband transmission (3/0/6)	
11	<p>Teaching contents: (3) 10.1.Passband signal demonstration 10.2.Digital modulation.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p>	G1.5, G3.1, G3.2, G3.3, G2.1, G2.2
	Self-study contents: (6) 10.3.Digital carrier system.	
	Chapter 10. Passband transmission (continuos) (3/0/6)	
12	<p>Teaching contents: (3) 10.4.M-ary modulation. 10.5.Compare to digital modulation techniques.</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p>	G1.5, G3.1, G3.2, G3.3, G2.1, G2.2
	Self-study contents: (6) 10.6.Channel estimation.	
	Chapter 11. Spread spectrum (3/0/6)	
13	<p>Teaching contents: (3) 11.1.Spread spectrum system' block diagram. 11.2.FHSS. 11.3.Random pseudo-sequences</p> <p>Teaching methods: + Theoretical lectures + Questions and discussion</p>	G3.1, G3.2, G3.3, G2.1, G2.2
	Self-study contents: (6) 11.4. Synchronously-cling technique.	

	Chapter 11. Spread spectrum (continuous) (3/0/6)	
14	Teaching contents: (3) 11.5.DSSS. 11.6.CDMA Teaching methods: + Theoretical lectures Questions and discussion <hr/> Self-study contents: (6) 11.7.CDMA system.	G3.1, G3.2, G3.3, G2.1, G2.2
15	Review	

12 Learning ethics:

Home assignments and projects must be done by the students themselves. Plagiarism found in the assessments will get zero point.

13 **First approved date:** 01/01/2012

14 **Approval level**

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Department

Instructor

Nguyen Minh Tam, Ph.D

Nguyen Ngo Lam, M.Eng

15 Syllabus updated process:

1st time: Updated content dated: 15/01/2014 <i>Contents:</i>	Instructor: Head of department: Vo Minh Huan, Ph.D
2nd time: Updated content dated: 15/01/2016 <i>Contents:</i>	Instructor: Head of department: Phan Van Ca, Ph.D
3rd time: Updated content dated: 06/05/2017 <i>Contents:</i>	Instructor: Dang Phuoc Hai Trang, M.Eng Head of department: Phan Van Ca, Ph.D

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