Analog communications Course Definition Form

1. Basic Information:

Course Name	Analog communications
Course ID	CEE306
Contact Hours (Registered Sessions)	30
Contact Hours (Synchronized Sessions)	18
Mid Term Exam	There is not
Exam	1.5
Registered Sessions Work Load	30
Synchronized Session Work Load	18
Credit Hours	5

2. Pre-Requisites:

Course	ID
Electronics	CEE202
Signals and systems	CEE203

3. Course General Objectives:

This course aims to introduce the student to communications system concept and to all its partial components and theirs functions, and to introduce him to analog and digital communications systems for focusing on analog systems. The student will recall the basic concepts of signals and apply the spectral analysis by means of Fourier series and Fourier transforms and linear time invariant systems modeling various communications channels and filters. The student will comprehend the modulation principle and its uses, then will study continuous wave analog modulation, as amplitude and angle modulation which translates the frequencies components of information messages to another frequency bandwidth more convenient for transmitting these messages across bandpass communications channel. He will also apply his earlier acquainted skills of analog electronics in implementing some modulation and detection functions. The student will be introduced to additive noise and the noise of internal origins, to their negative effects on analog communications systems performance, and to the methods of measuring them by means of output signal to noise ratio. In addition, he will learn receiver parameters and the principle of superheterodyne receivers.

This course constitutes a basic introductory to some other courses in higher levels, such as digital communications.

4. Intended Learning Outcomes (ILO):

Code	Intended Learning Outcomes
ILO1	Outlining the block diagram of a communications system and distinguishing between analog and digital communications systems.
ILO2	Understanding the necessity of modulation.
ILO3	Applying spectral analysis tools on signals.
ILO4	Understanding the principle of analog modulation and its types.
ILO5	Understanding the basics of angle (phase and frequency) modulation and its types.
ILO6	Understanding noise, its estimation methods and its effects on analog communications.
ILO7	Learning receiver parameters and the principle of superheterodyne receivers.

5. Course Syllabus (18 hours of total synchronized sessions)

- RS: Recorded Sessions; SS: Synchronized Sessions;

ILO	Course Syllabus	RS	SS	Type	Additional Notes
ILO1	• Introduction of communications and messages. • Communications systems classification and their essential parts. • Communications system disturbances.	3	1.5	☐ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	
ILO1	• Brief recalling the concept of signals and their classifications. • The basic concepts of signals in frequency domain and the main tools of spectral analysis, like Fourier series and Fourier transforms.	4.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	Matlab workouts
ILO1	• Transmitting signals across a	4.5	3	☒ Exercises	Matlab workouts

ILO					
ILO2	communications channel. • The basic concepts of linear time invariant systems in frequency domain.			☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	
ILO2 **ILO3** **ILO4**	• Analog modulation (AM). • Double side band (DSB). • Full AM or Large carrier AM. • Single side band AM (SSB). • Vestigial side band (VSB). •	4.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	Matlab workouts
ILO2 **ILO3** **ILO5**	Angle modulation including: • Phase modulation (PM). • Frequency modulation (FM).	4.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	Matlab workouts
ILO3 **ILO6**	• Noise effects on performance of analog communications systems. • Additive noise accompanied the signal at the input to the receiver and • The noise of internal origins.	4.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	Matlab workouts
ILO3 **ILO7**	• Receiver parameters. • The principle of direct conversion receiver. • The principle of superheterodyne receiver. • Intermediate frequency image and reducing its effects.	4.5	3	☒ Exercises ☐ Assignments ☐ Seminars ☐ Projects ☒ Practices ☐ Others	Matlab workouts

6. Assessment Criteria (Related to ILOs)

ISC	Interactive Synchronized Collaboration		Ex	Exams		Rpt	Reports
PF2F	Presentations and Face-to-Face Assessments		PW	Practice Work			

ILO Code	ILO	Intended Results	Assessment Type				
			ISC	PW	Ex	PF2F	Rpt
ILO1	• Introduction of communications and messages. • Communications systems classification and their essential parts. • Communications system disturbances.		X		X		
ILO1	• Brief recalling the concept of signals and their classifications. • The basic concepts of signals in frequency domain and the main tools of spectral analysis, like Fourier series and Fourier transforms.		X	X	X		
ILO1 ILO2	• Transmitting signals across a communications channel. • The basic concepts of linear time invariant systems in frequency domain.		X	X	X		
ILO2 ILO3 ILO4	• Analog modulation (AM). • Double side band (DSB). • Full AM or Large carrier AM. • Single side band AM (SSB).		X	X	X		

	• Vestigial side band (VSB).							
ILO2 ILO3 ILO5	Angle modulation including: • Phase modulation (PM). • Frequency modulation (FM).			X	X	X		
ILO3 ILO6	• Noise effects on performance of analog communications systems. • Additive noise accompanied the signal at the input to the receiver and • The noise of internal origins.			X	X	X		
ILO3 ILO7	• Receiver parameters. • The principle of direct conversion receiver. • The principle of superheterodyne receiver. • Intermediate frequency image and reducing its effects.			X	X	X		

7. Practice Tools:

Tool Name	Description
MATLAB	An important calculating tool enables the student leveraging his knowledge level and understanding of signals, noise, modulation methods and observing signal form variations according to the modulation method and how they are affected by noise. This tool enables the student to develop practical skills, and comprehend the principle of system performance and output signal to noise ratio.

8. Main References

1. 'Introduction to Analog and Digital Communications', 2nd edition, by Simon Haykin and Michael Moher, John Wiley & Sons, 2007

2. 'Communication Systems', 5th edition, by A. Bruce Carlson, Paul Crilly,McGraw−Hill, 2009

9. Additional References