







52. Course Specification of Communication Systems

	I. Course Identification and General Information:							
1.	Course Title:	Comn	Communication Systems					
2.	Course Code & Number:	CNE429						
		С.Н			Total			
3.	Credit hours:	Th.	Tu.	Pr.	Tr.	Total		
			1	2	-	3		
4.	Study level/ semester at which this course is offered:	Fifth year / Second semester						
5.	Pre –requisite (if any):	Digital Communications (CNE323)				3)		
6.	Co –requisite (if any):	None.						
7.	Program (s) in which the course is offered:	Communication Engineering and Networks						
8.	Language of teaching the course:	English						
9.	Location of teaching the course:	Electrical Engineering Department				nt		
10.	Prepared By:	Asst. Prof. Dr. Ali Nagi Nosary						
11.	Date of Approval							

II. Course Description:

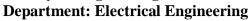
This course consists of three main parts. The first part examines satellite telecommunication systems with an emphasis on modern systems. Topics include a historical perspective, orbital mechanics and constellations, choice of orbital parameters, propagation considerations, link budgets, interference issues and other obstacles. It also explains Earth stations optimization in addition to modulation, multiplexing and multiple-access techniques.

The second part provides an overview on radars including physical principles, system components, the processing chain and typical applications, target detection and the radar equation. Moreover, it covers main radar concepts such as ambiguities, Doppler shift, and radar cross section. Many types of radar systems will be introduced including FMCW radars, Pulsed radars, Antennas and phased arrays, and imaging radars (SAR).

The third part provides an overview on TV systems.

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	III. Course Intended learning outcomes	Referenced
	(CILOs) of the course	PILOs
a1	Define both Satellite communication systems and radar systems regarding design, components, and parameters.	A2
b1	Design a simple satellite communication system or a basic radar system.	B1
c1	Design link power budget for satellites.	C2
c2	Install satellite's small earth stations for services such as VSAT.	C3
d1	Conduct a good researches of modern types of communication systems after being familiar with the principles of basic communication systems.	D5

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:				
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies		
a1- Define both Satellite communication systems and radar systems regarding design, components, and parameters.	 Lectures Cooperative Learning Practical Training Interactive Class Discussion 	Homework,Project,Mid and Final Exams		

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:				
Course Intended Learning Outcomes Teaching strategies Assessment Strategies				
b1- Design a simple satellite communication system or a basic radar system.	1	Homework,Project,Mid and Final Exams		

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© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:					
Cour	se Intended Learning Outcomes	Teaching strategies	Assessment Strategies		
c1- Design link power budget for satellites.		 Lectures Cooperative Learning Practical Training Interactive Class Discussion 	Homework,Project,Mid and Final Exams		
c2- earth	Install satellite's small stations for services such as VSAT.	■ Practical Training	■ Training Report		

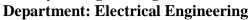
(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:					
Course Intended Learning Outcomes	Course Intended Learning Outcomes Teaching strategies Assessment Strategies				
d1- Conduct a good research of	Lectures				
modern types of	Cooperative Learning	■ Dwoicat			
communication systems after	Practical Training	Project			
being familiar with the principles of	Class Discussion				
basic communication systems.	Project				

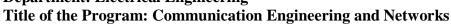
I	IV. Course Content:						
	A – Theoretical Aspect:						
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours		
1.	Introduction to Satellite communication	a1, b1, c1, d1	 Introduction Basics Applications of Satellites Frequency Allocation of Satellites Types of Orbits 	1	2		

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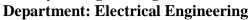


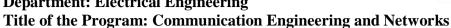
2.	Orbits and lunching methods	a1, b1, c1, d1	IntroductionKepler"s LawsOrbital Elements	1	2
3.	Geostationary orbit	a1, b1, c1, d1	IntroductionAntenna Look AnglesSun Transit Orbit	1	2
4.	Space segment	a1, b1, c1, d1	 Introduction The Power Supply Attitude Control Station Keeping Thermal Control TT&C Subsystem Transponders The Antenna Subsystem 	1	2
5.	Earth segment	a1, b1, c1, d1	 Introduction Receive-Only Home TV Systems Transmit-Receive Earth Stations 	1	2
6.	Satellite Systems	a1, b1, c1, d1	ThurayaIridiumGPS	1	2
8.	Introduction to Radar systems	a1, b1, d1	 Introduction Radar Applications Basic Principles Modulation Types Radar Generic System Radar Antennas Basic Radar Types Pulse Transmission Continuous Wave 	1	2
9.	Radar Fundamentals	a1, b1, d1	Range, RangeResolutionDoppler FrequencyCoherence	2	4

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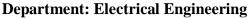
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Numbe	Number of Weeks /and Units Per Semester		14	28	
			CodingMultiplex and signaling		
			TV audio		
			synchronization	3	6
10.	TV. Systems	a1, b1, d1	Standardization Timing and		
			Signal Domain,		
			■ Signal Values		
			■ TV signals		
			■ Introduction		
			Comparison of trackers		
			Low angle trackingTracking in range		4
			limitations		
10.	Radar	a1, b1, d1	■ Tracking accuracy	2	
	Tracking		sequential lobing		
			Conical scan and		
			Mono-pulse tracking		
			Tracking with radar		
			(RCS)		
			 Radar Equation Radar Cross Section 		
			Radar Equation		













$\mathbf{B} - \mathbf{T}$	B – Tutorial Aspect:				
Order	Topics	Number of Weeks	Contact hours	Learning Outcomes	
1.	Frequency Allocation of Satellites and Types of Orbits	1	2	a1, b1, c1, d1	
2.	Orbiting and lunching	1	2	a1, b1, c1, d1	
3.	Geostationary orbit and Antenna Look Angles	1	2	a1, b1, c1, d1	
4.	Space segment related problems	1	2	a1, b1, c1, d1	
5.	Earth Segment	1	2	a1, b1, c1, d1	
6.	Satellite Systems	1	2	a1, b1, c1, d1	
6.	Basic Principles of radar, Modulation Types, Radar Generic System, Radar Antennas, and Pulse Transmission	1	2	a1, b1, d1	
7.	Range, Range Resolution, Doppler Frequency, Coherence, Radar Equation and Radar Cross Section (RCS)	2	4	a1, b1, d1	
8.	Radar tracking	2	4	a1, b1, d1	
9.	TV signals	1	2	a1, b1, d1	
10.	TV coding	1	2	a1, b1, d1	
11.	TV multiplexing	1	2	a1, b1, d1	
Numbe	Number of Weeks /and Units Per Semester 14 28				

V. Teaching strategies of the course:

- Lectures
- Cooperative Learning
- Practical Training
- Class Discussion
- Project

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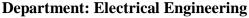
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Title of the Program: Communication Engineering and Networks





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VI. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Problems Sheet #1	a1, b1, c1	2	1.5
2.	Problems Sheet #2	a1, b1, c1	4	1.5
3.	Problems Sheet #3	a1, b1, c1	6	1.5
4.	Problems Sheet #4	a1, b1, c1	8	1.5
5.	Training Report	a1, b1, c.2,	10	16.5
	Total			22.5

VII.	VII. Schedule of Assessment Tasks for Students During the				
Semester:					
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Midterm Exam	7^{th}	22.5	15%	a1, b1, c1
2.	Assignments and Report	12 th	22.5	15%	a1, b1, c1, c.2
3.	Project	12 th	15	10%	a1, d1
4.	Final Exam	16 th	90	60%	a1, b1, c1
	Total		150	100%	

VIII. Learning Resources:

• Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

- 1. Dennis Roddy 2006 Satellite Communications, Fourth edition, India, Mcgraw-Hill
- 2. M.A. Richards, J.A. Scheer, W.A. Holm 2010 –Principles of Modern Radar: Basic Principles

2- Essential References.

1. Shree Krishna Sharma, Symeon Chatzinotas and Pantelis-Daniel Arapoglou, Satellite Communications in the 5G Era, The Institution of Engineering and Technology, London, United Kingdom, 2018

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2.	Gerard Maral and Michel Bousquet, Satellite Communications Systems, fifth
	edition, Wiley, 2009

3- Electronic Materials and Web Sites etc.

- 1. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-851-satellite-engineering-fall-2003/
- 2. https://ocw.mit.edu/resources/res-ll-001-introduction-to-radar-systems-spring-2007/

IX. Course Policies:

Class Attendance:

1. A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic

Tardy:

2. For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.

Exam Attendance/Punctuality:

A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam-

Assignments & Projects:

4. The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-

Cheating:

5. For cheating in exam, a student will be considered as **failure**. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty-

Plagiarism:

Plagiarism is the attending of a student the exam of a course instead of another student.

6. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.

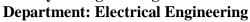
Other policies:

- 7. | Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room
 - Mobile phones are not allowed in class during the examination.

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Reviewed	Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek		
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	President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi		
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	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa		
	Assoc. Prof. Dr. Ahmed Mujahed		
	Asst. Prof. Dr. Munasar Alsubri		

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