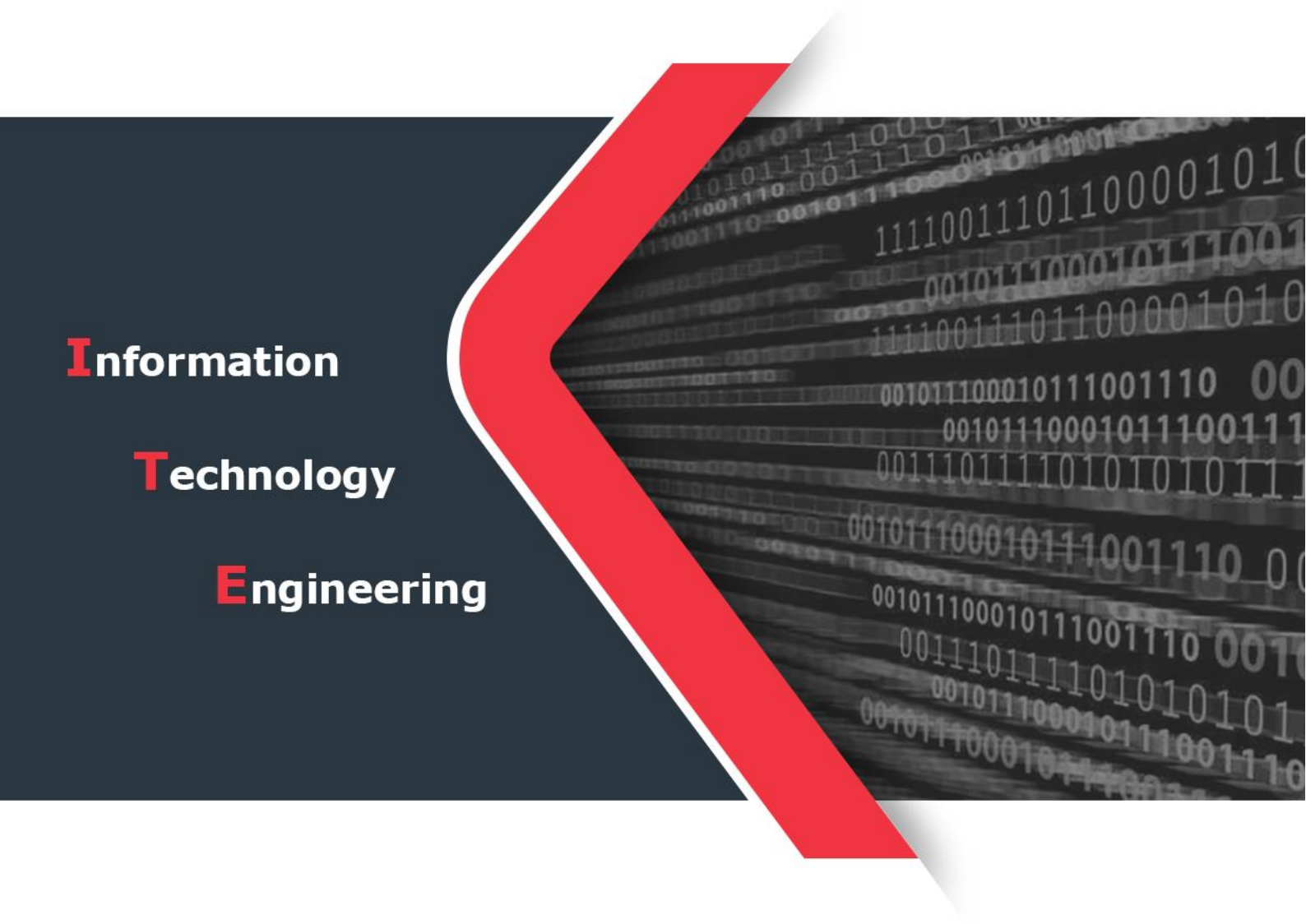
الجامعة الافتراضية السورية
SYRIAN VIRTUAL UNIVERSITY

"Telecommunication System "

Course Definition



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Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Telecommunication System
Course Code	BTS501
Number of Presentational Sessions*	9×2
Number of Synchronous Sessions**	9
Number of Shorter Tests***	2
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	54
Practical Sessions Work Load (hrs.)	27
Credit Hours	5

***Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).**

****Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).**

*****Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.**

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions (. This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

2. Prerequisites courses:

Course	Code
Matlab for Numerical Computing	CML201
Analog Communications	CEE306
Digital Signal Processing	CEE205

3. Course Objectives:

This course aims to enable students to understand the basics of "Digital Communications" and "Information and Communication Theory". The course focuses mainly on the following:

- The use of Probability Theory in the computation of system performance and detection theory
- Base Band and Pass Band modulations (As in Wire Communications and Radio Communications)
- Demodulation methods.
- Noise and its effect on system performance.
- Key Trade-Offs in Communications: (Modulation and Coding Trade-Off, Spectrum and Power efficiencies Trade-Off).
- Channel Coding for Error Detection and Correction.
- General evaluation of communication system.

This Course is tightly related to other courses like: Analog Communications, Signal and Systems, Digital Signal Processing and constitutes a basic introductory to some other courses in higher levels. The course "Matlab for numerical computing is necessary for Practical Works.

4. Learning Outcomes (LO):

By the end of this course the learner is expected to:

- Understand the basic principles of Digital Communication Systems
- Understand the information and Communication theories
- Understand the applications of key Probabilities in digital communication and detection theory.
- Understand modulation methods in both in the Base Band and Pass Band. (As in Wire Communications and Radio Communications)
- Understand demodulation methods and Identifying noise and its effect on signal detection and system performance
- Learning Channel Coding fundamentals and Understand error detection and correction principles and their effect on system performance.
- Understand the trade-off between modulation and coding on system level
- Understand the trade-offs between spectrum efficiency and power efficiency.

5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports ***
CH1	Understanding the basics of Probability Theory and its applications in Digital Communication and detection theory.	Comprehension –Analytical Thinking –Tools and Application Hands– On	√	√	√	√	√
CH2	Understanding Principles of Digital Communications and its trade–offs in the Base Band and Pass Band modulations	Comprehension –Analytical Thinking –Tools And Application Hands– On	√	√	√	√	√

	(As in Wire Communications and Radio Communications) and demodulation methods.						
CH3	Understanding demodulation principles and methods and Comparing the performances and the trade-offs.	Comprehension -Analytical Thinking -Tools And Application Hands- On	√	√	√	√	√
CH4	Understanding the trade-offs between spectrum efficiency and power efficiency	Comprehension -Analytical Thinking -Tools And Application Hands- On	√	√	√	√	√
CH5	Identifying noise and its effect on signal	Comprehension -Analytical Thinking -Tools	√	√	√	√	√

	detection and system performance	And Application Hands– On					
CH6	Understanding error detection and correction principles and their effect on system performance	Comprehension –Analytical Thinking –Tools And Application Hands– On	√	√	√	√	√

***The final exam is two hours long and is given at the end of the course.**

****Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.**

*****Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.**

6. Course Syllabus:

Chapter	Subject	Content	Number of Learning Objects	Number of synchronous Learning Objects
CH1	Understanding the basics of Probability Theory and its applications in Digital Communication and detection theory.	• Communications systems. • Frequency allocations. • Information measurement • Channel Capacity • Coding and Codes efficiency.	5	2
CH2	Understanding Principles of Digital Communications and its trade-offs in the Base Band and Pass Band modulations (As in Wire Communications and Radio Communications) and demodulation methods.	• Probability • Probability density and distribution functions. • Expectation and moments. • Important distributions. • Random processes. • Power Spectral Density	6	3
CH3	Understanding demodulation	• Pulse modulations	4	2

	principles and methods and Comparing the performances and the trade-offs.	• Pulse code modulation PCM • Line Coding. • Differential Coding and Linear Prediction Coding		
CH4	Understanding the trade-offs between spectrum efficiency and power efficiency	• Error probability. • Eye pattern and Intersymbol interference. • Spectrum efficiency. • Matched filter. • Coherent detection • Non-coherent detection	**6**	**3**

CH5	Identifying noise and its effect on signal detection and system performance	• Error probability. • Eye pattern and Intersymbol interference. • Spectrum efficiency. • Matched filter. • Coherent detection • Non-coherent detection	**6**	**3**
CH6	Understanding error detection and correction principles and their effect on system performance.	• Linear Block Coding. • Convolutional Codes. • Reed Solomon Codes. • Interleaving Codes. • Turbo Codes. • Modulation and Coding Trade-Offs	**6**	**3**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description
MATLAB	An important computation tool enabling students to develop their practical skills and understanding the concepts in the course, in addition to modulation and demodulation methods and performance evaluation

- **Practical Activities per Chapters:**

Chapter	Activities Type	Remarks
CH1	☑ Exercises ☑ Assignments ☐ Webinars ☐ Project ☑ Experiment ☑ Other	
CH2	☑ Exercises ☑ Assignments ☑ Seminars ☐ Projects ☑ Practices ☑ Others	

CH3	☑ Exercises ☑ Assignments ☐ Seminars ☐ Projects ☑ Practices ☐ Others	
CH4	☑ Exercises ☑ Assignments ☑ Seminars ☐ Projects ☑ Practices ☐ Others	
CH5	☑ Exercises ☑ Assignments ☑ Seminars ☐ Projects ☑ Practices ☐ Others	
CH6	☑ Exercises ☑ Assignments ☐ Seminars ☑ Projects ☑ Practices ☐ Others	

8. References:

- 'Digital and Analog Communication Systems', 8th edition, by Leon W. COUSH II, Pearson Education International, 2013
- 'Introduction to Analog and Digital Communications', 2nd edition, by Simon Haykin and Michael Moher, John Wiley & Sons, 2007
- 'Communication Systems', 5th edition, by A. Bruce Carlson, Paul Crilly, McGraw-Hill, 2009
- 'Digital Communications: Fundamentals and Applications", 2nd edition, by, Bernard SKLAR, Pretice Hall P T R, 2001