University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Electrical and Computer Engineering
Bachellor of Science in Electrical Engineering

Course Syllabus

1. General Information:

Alpha-numeric codification: INEL 5315
Course Title: Theory of Communications II
Number of credits: 3
Contact Period: 3 hours of lecture
Elective in INEL

2. Course Description:

English: Preface: Information Theory. Coding Theory. Signal Design. Noise and Probability Error.

Spanish: Prefacio: Teoría de Información. Teoría de Códigos. Diseño de Señales. Ruido y Probabilidad de Error.

3. Pre/Co-requisites and other requirements:

ININ 4011 and INEL 4301

4. Course Objectives:

Theory of communications II (INEL 5315) helps students to discover the theoretical Underpinnings of modern telecommunication systems. After studying random processes the student should be able to: analyze systems driven by random signals and subjected to noise, calculate the information content of signals to help attain efficient transmission, discuss various error-control mechanisms for reliable communications over noisy channels.

5. Instructional Strategies:

☒conference ☐discussion ☐computation ☐laboratory

☐seminar with formal presentation ☐seminar without formal presentation ☐workshop

☐art workshop ☐practice ☐trip ☐thesis ☐special problems ☐tutoring

☐research ☒other, please specify: (Short) Project. Take-home problems.

6. Minimum or Required Resources Available:

Materials, equipment, and physical facilities needed to fulfill the course objectives.

7. Course time frame and thematic outline

Outline	Contact Hours
Background and preview	1
Random processes: Stationary processes; Ergodic processes; Power spectral density; Gaussian process	6
Random processes: Narrowband noise. Representations in-phase and in-quadrature, envelope and phase. Application: flat fading channel	4
Elements of information theory: Entropy and information. Source-coding theorem. Data compaction.	5
Elements of information theory: Discrete memoryless channels. Mutual information. Channel capacity. Channel-coding theorem. Differential entropy and mutual information. Information capacity theorem	8
Error-control coding: Linear block codes. Cyclic codes. Convolutional	9

codes.Trellis-coded modulation	
Error-control coding: Introduction to compound codes (Turbo codes)	1
Baseband and passband digital transmission	8
Spread-spectrum modulation	1
Exams	2
Total hours: (equivalent to contact period)	45

8. Grading System

☒ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies

(Suggested): The faculty member teaching the course will provide the student with the evaluation strategy he/she will be using throughout the semester. This will be done within the first week of classes.

	Quantity	Percent
☒ **Exams**	**2**	**50**
☒ **Final Exam**	**1**	**25**
☐ **Short Quizzes**		
☐ **Oral Reports**		
☐ **Monographies**		
☐ **Portfolio**		
☒ **Projects**	**1**	**10**
☐ **Journals**		
☒ **Other, specify: Take-home, papers and oral reports.**	**2**	**15**
TOTAL:		**100%**

10. Bibliography:

Ziemer, R.E., and W.H. Tranter (2001) Principles of communications: systems modulation and noise (5th edition).Wiley.

Mc. Eliece R. J. (2002). The theory of information and coding (2nd edition). Cambridge.

Simon Haykin (2000). Communication systems (4th edition). Wiley.

Tse D. and P. Viswanath (2005). Fundamentals of wireless communications. Cambridge.

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

12. Contribution of course to meeting the requirements of Criterion 5

Math	Basic Science	General	Engineering Topic
			√

12. Course Outcomes	Map to ABET Outcomes
1. Apply random process models for the analysis of communication systems	a
2. Develop analytical and computational skills to analyze data transmission in white Gaussian noise.	a, k
3. Analyze the importance of M-ary data communication systems.	a
4. Evaluate communication systems using information theory.	a
5. Apply methods that provide data integrity using forward error correcting codes.	a

Person who prepared this description and date of preparation: Mario Ierkic. Aproved by Miguel Vélez abril 08.