



**ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL**  
**Faculty of Electrical and Computer Engineering**  
**COURSE SYLLABUS**  
*Digital Telephony*

**1. CODE AND NUMBER OF CREDITS**

<b>CODE</b>	FIEC04986	
<b>NUMBER OF CREDITS : 4</b>	<b>Theoretical: 4</b>	<b>Practical: 0</b>

**2. COURSE DESCRIPTION**

Course covers technological aspects of Telephony as an integral part of Telecommunication Systems. Main concepts include switching principles, network topology, traffic theory, common control. Comparative approach between voice spectrum analysis and network frequency response is treated with some detail. A review of POTS switching, core and access networks is shown as basis for digital processing. Time and space switching, and signaling control systems are emphasized. Linear Predicting Codes are then explained, prior to Voip, and SIP and H323 protocols.

**3. PRE-REQUISITES AND CO-REQUISITES**

<b>PRE-REQUISITES</b>	FIEC04960 DIGITAL COMUNICATIONS
<b>CO-REQUISITES</b>	FIEC04978 DATA NETWORKS I

**4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE**

<b>CORE TEXT</b>	1. John C. Bellamy, Digital Telephony, 3 <sup>rd</sup> edition, Wiley and Sons
<b>REFERENCES</b>	1. Lawrence Harte, Richard Dreher, Dave Bowler, Toni Beninger, Signaling System Seven, 3rd Edition, Althos Publising 2. Daniel Collins, Carrier Grade Voice Over IP, McGraw-Hill

**5. COURSE LEARNING OUTCOMES**

The student after completing the course will be able to:

1. Understand the different technologies and standards that apply in the phone market, both traditional POTS known as VoIP. Must be able to describe analog systems and switching systems controlled by software, and space-time switching.
2. Manage the concepts and applicability of access networks and transport
3. Know and use the speech coding methods for linear prediction
4. Understand the operation parameters and characteristics of SIP and H.323 for VoIP systems.
5. Professionals must lead projects that impact society, contributing to their welfare.

**6. COURSE PROGRAM**

- I. Presentation of Subject, Organization, Objectives, Academic Plan, Grading System and Evaluation (Session 1, 0.5 hours)
- II. Introduction to Telephony (Session 1, 1.5 Hr)
- III. Analog Telephony: Telephony elements, Switching, Access Networks, Transport Networks. Traffic Notions (Session 2 and 3, 4 hr)
- IV. Network Infrastructure: Access and Transport. Means of transmission network topology. (Sessions 4 and 5, 4 hr)
- V. Switching function, central hierarchy, technological history. Numbering (Session 6, 2 hr)
- VI. Transmission: trunks. Bandwidth Voice, streaming media, features, properties and limitations of each medium. (Sessions 7 and 8, 4 hr)
- VII. Signaling Systems: Originate, establish, maintain, manage and end a phone call. Analog and Digital Signaling. (Session 9 and 10, 4 hr)
- VIII. Review of Concepts of PCM, TDM, FDD, TDD. Digital transmission, BER, MER (Session 11, 4 hr)

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IX.	Digital Switching, units with SPC, digital matrices, category switching, space switching. Rectangular arrays (Session 12 and 13, 4 hr)
X.	Multistage Switching: 3-stage matrices, probability of blocking, non-blocking switching, Klos criteria, Lee formulas (Session 14 and 15, 4 hr)
XI.	Time Division Switching, TSI, space-time hybrid switching (Session 16, 2 hr)
XII.	Digital Signaling SS7: objective, elements, dependency network, protocol development SS7 signaling link types, message structure, attachment to the OSI model. (Session 17 and 18, 4 hr)
XIII.	Bandwidth: Definition Erlang, Erlang Formulas, Tables for models Erlang B and C. Model for Call Center. (Session 19, 2 hr)
XIV.	Voice over IP: Introduction, overview of TCP / IP. Codecs needed, Linear Predictive Coding (Session 20 and 21, 4 hr)
XV.	SIP components, structure, management, control, messaging, functionality, examples of calls (Session 22 and 23, 4 hr)
XVI.	H.323: components, structure, management, control, messaging, functionality, examples of calls (Session 24 and 25, 4 hr)
XVII.	Application SIP ATA solutions, programming, implementation and non-Nat networks, analysis of results (Session 26 and 27, 4 hr)

#### 7. WORKLOAD: THEORY/PRACTICE

The subject is taught four hours a week: 4 hours of theory.  
Where possible and after coordination with business, technical visits are made

#### 8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

This course allows developing engineering solutions.  
Students research, review and discuss specific issues of high technical content on Telephony  
Students present design solutions for telecommunications systems integration proposals raised in class

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	

#### 9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) An ability to apply knowledge of mathematics, science and engineering.			
b) An ability to design and conduct experiments, and to analyze and interpret data	High	1	Contrast the different alternatives presented to find the most efficient solution
c) An ability to design a system, component or process to satisfy realistic constraints.	High	1	Develop ability to decompose a small constituent parts requirements, and assemble the final solution
d) An ability to function on multidisciplinary teams.	Medium	2	Being able to contribute ideas and approaches that contribute to the final solution assigned to a working group
e) An ability to identify, formulate and solve engineering problems.	Medium	5	Understanding the impacts ethical, legal, security and social impact in developing engineering applications



f) An understanding of ethical and professional responsibility.			
g) An ability to communicate effectively.	Medium	5	Interact with the elements of society and organizations to develop solutions that benefit society
h) A broad education necessary to understand the impact of engineering solutions in a social, environmental, economic and global context.			
i) A recognition of the need for, and an ability to engage in life-long learning.	Medium	3, 4	Learn to distinguish clearly the deliverables of an assignment, and current tools used to develop the solution
j) A knowledge of contemporary issues.	High	5	Develop the ability to lead decision making
k) An ability to use the techniques, skills, and modern tools necessary for engineering practice.			
l) Capacity to lead, manage and undertake projects.			

**10. EVALUATION IN THE COURSE**

Evaluation activities	
Exams	X
Tests	X
Homework/tasks	X
Projects	X
Laboratory/Experiments	
Class participation	X
Visits	X
Other	

**11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION**

Created by	CESAR YEPEZ F.
Date	ABRIL-2013

**12. APPROVAL**

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Mrs. Leonor Caicedo G.	NAME: Ing. Marcos Mendoza
SIGNATURE: 	SIGNATURE: 
Date of approval by the Directive Council: 2013-537 2013-10-7	ESCUOLA SUPERIOR POLITECNICA DEL LITORAL <b>Ing. Marcos Mendoza V.</b> DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

**13. VALIDITY OF THE SYLLABUS**

RESOLUTION OF THE POLYTECHNIC BOARD:	13-12-343
DATE:	2013-12-12

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