INSTITUTO POLITÉCNICO NACIONAL

SECRETARÍA ACADÉMICA

DIRECCIÓN DE EDUCACIÓN SUPERIOR

SYNTHESIZED SCHOOL PROGRAM

ACADEMIC UNIT: Escuela Superior de Cómputo

ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales.

LEARNING UNIT: Mobile Communications   **LEVEL:**   III

AIM OF THE LEARNING UNIT:
The student evaluates the use of different communication technologies, based on radiofrecuency signal propagation models.

CONTENTS:
    I.   Introduction to Mobile Communications.
    II.   Mathematical Foundations.
    III.   Cellular Networks.
    IV.   Global Positioning System (GPS).
    V.   Zig Bee Communication.
    VI.   Sensor Networks.

TEACHING PRINCIPLES:
The present unit will be approached with the learning strategy guided by projects, the professor will apply the deductive method, with which were carried out the learning activities, same that will allow the student's participation, as well as the experimental development of efficient communication systems, covering necessities of radiocomunicación links, this starting from the use of theory and practical tools that you/they justified the use of certain propagation patterns. They will be applied technical, such as: I work in team, exhibition of complementary topics, directed discussion as well as the realization of a hardware project and software.

**EVALUATION AND PASSING REQUIREMENTS:**
The program will evaluate the students in a continuous formative and summative way, which will lead into the completion of learning portfolio. Some other assessing methods will be used, such as revisions, practical´s, class participation, exercises, learning evidences and a final project.

Other means to pass this Unit of Learning:
- Evaluation of acknowledges previously acquired, with base in the issues defined by the academy.
- Official recognition by either another IPN Academic Unit of the IPN or by a national or international external academic institution besides IPN.

REFERENCES:

- Firtman, M. (2004). Programación para Celulares Java. Paraguay: Ed. User Code. ISBN 987-526-227-7

- Hwei P.S. (1998) Análisis de Fourier México Prentice Hall; ISBN 968 444 356 0

- Kolawole M. O. (2002) Satellite Communication Engineering CRC Press;ISBN 082470777X;

- Pareek, D. (2006) Business Intelligence for Telecomunication; Auerbach Publishind. ISBN 0849387922

- Raghavendra, K. M. (2004) Wireless Sensor Networks. United States of America. Springer Science Busines Media, Inc. ISBN 1-4020-7883-8
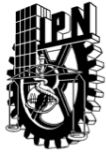
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SECRETARÍA ACADÉMICA

DIRECCIÓN DE EDUCACIÓN SUPERIOR

ACADEMIC UNIT: Escuela Superior de Cómputo.
ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales
LATERAL OUTPUT: Analista Programador de Sistemas de Información.
FORMATION AREA: Professional.
MODALITY: Presence.

LEARNING UNIT: Mobile Communications.
TYPE OF LEARNING UNIT: Theorical - Practical, Optative.
USE: August, 2011
LEVEL: |||.
CREDITS: 7.5 Tepic, 4.39 SATCA

EDUCATIVE AIM

This learning unit contributes to the profile of graduated on Ingeniería en Sistemas Computacionales, when developing programming abilities and hardware design to offer efficient radiocomunicación systems, as well as the analysis in the domain of the frequency of the radio links, making analyzers' of spectra use and by means of the analysis of Fourier.

It requires of the units of learning Theory of signs and Advanced Mathematics for the engineering, the theory of signs is useful to analyze the signs of the communication links, in the domain of the time and the frequency, and the advanced Mathematics will be of utility to understand the signs determinísticas by means of the analysis of Fourier.

PURPOSE OF THE LEARNING UNIT:

The student evaluates the use of different communication technologies, based on radiofrecuency signal propagation models.

CREDITS HOURS	
THEORETICAL CREDITS / WEEK:	3.0
PRACTICAL CREDITS / WEEK:	1.5
HOURS THEORETICAL /TERM:	54
HOURS PRACTICAL / SEMESTER:	27
HOURS AUTONOMOUS LEARNING:	54
CREDITS HOURS / SEMESTER:	81

LEARNING UNIT DESIGNED BY:
Academia de Sistemas Distribuidos.

REVISED BY:
Dr. Flavio Arturo Sánchez Garfias.
Subdirección Académica

APPROVED BY:
Ing. Apolinar Francisco Cruz Lázaro.
Presidente del CTCE

AUTHORIZED BY: Comisión de Programas Académicos del Consejo General Consultivo del IPN

Ing. Rodrigo de Jesús Serrano Domínguez
Secretario Técnico de la Comisión de Programas Académicos

LEARNING UNIT: Mobile Communications.   **PAGE:** 3 **OF** 12

N° THEMATIC UNIT: I	**TITLE:** Introduction to Mobile Communications

UNIT OF COMPETENCE

The student classifies the standards and mobile communications technologies, based on its application.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
1.1 1.1.1 1.1.2	Development historical of the communications Guided Communications Not Guided Communications	0.5		1.0		5B,9B
1.2 1.2.1	Mobile typical communications Standards of the not guided communications	0.5	1.0	1.0	0.5	
1.3 1.3.1	Applications of the mobile communications Implementation of Systems of Mobile Communication	0.5		2.0	1.5	
1.4	International norms in communications	0.5		2.0	1.5	
	Subtotals:	2.0	1.0	6.0	3.5	

TEACHING PRINCIPLES

The present unit it will be approached starting from the learning strategy guided to projects and heuristic method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION

Assessment
Portfolio of Evidences:

Conceptual Map	10%
Cooperative Presentation	20%
Report of Practical	20%
Project proposal	10%
Rubric of Self-Evaluation	5%
Rubric of Co-Evaluation	5%
Learning Evidence	30%

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N° THEMATIC UNIT: II   **TITLE:** Mathematical Foundations.

UNIT OF COMPETENCE

The student solves problems of mathematical analysis of signals in time domain, based on Fourier Transform.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
2.1 2.1.1	Transformed quick of Fourier Algorithm of FFT	1.0		2.0		3B,5B
2.2 2.2.1	Transformed special Algorithm of those transformed	0.5		1.0	1.5	

2.3
2.3.1
2.3.2
	Stochastic processes in communications
	  Curves of Gauss
	  Curves of Raleigh
		1.0	0.5	1.0		

2.4 2.4.1	Basic operations in the statistical inference Algorithm of mathematical inference	0.5	0.5	1.0	2.0	
2.5	The energy, the power and their spectrum	0.5		1.0		
2.6 2.6.1	Recognition of patterns in communications Recognition algorithms	0.5		2.0		
	Subtotals:	4.0	1.0	8.0	3.5	

TEACHING PRINCIPLES

The present unit will be approached starting from the learning strategy guided to projects and deductive method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, resolution of problems, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION

Portfolio of Evidences:

Conceptual Map	10%
Cooperative Presentation	10%
Report of Practical	20%
Advance of project	15%
Rubric of Self-Evaluation	5%
Rubric of Co-Evaluation	5%
Learning Evidence	30%
Problem solving	5%

N° THEMATIC UNIT: III   **TITLE:** Cellular Networks

UNIT OF COMPETENCE
The student implements applications for CLDC devices based on development platforms.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	

3.1
3.1.1
3.1.2
	Technology in cellular communication
	  Technology GSM
	  TDMA
		1.0	0.5	1.0	0.5	2B,6C

3.2
3.2.1
	Software of development of applications
	  Programming of Algorithms of
	  Positioning
		0.5	0.5	1.0	1.5	

3.3
3.3.1
 	
3.3.2
	Communication interfaces
	  Programming in java of interfaces of
	  communication
	  Programming in LabVIEW of interfaces
	  of communication
		0.5		1.0	1.5	

3.4
3.4.1
	Software handling for applications
	  Implementation of the software in a system
	  hybrid
		0.5		1.0		

3.5
3.5.1
	Control of Hardware by means of cellular
	  Programming of interfaces using
	  J2ME
		1.5				

	Subtotals:	4.0	1.0	4.0	3.5	

TEACHING PRINCIPLES

The present unit will be approached starting from the learning strategy guided to projects and deductive method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, resolution of problems, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION
Portfolio of Evidences:
Conceptual Map	10%
Cooperative Presentation	10%
Report of Practical	20%
Advance of project	15%
Rubric of Self-Evaluation	5%
Rubric of Co-Evaluation	5%
Learning Evidence	30%
Problem solving	5%

N° THEMATIC UNIT: IV   **TITLE:** Global Positioning System.

UNIT OF COMPETENCE

The student implements applications of satellital tracking via GPS, based on development platforms.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	

4.1
4.1.1
4.1.2
	Communications Satellites
	  Orbits Lowers (LEO)
	  Orbits Geostationary (GEO)
		0.5		1.0		4C,6C,8B

4.2
4.2.1
4.2.2
	The Satellite
	  PIRE
	  Figure of Merito
		0.5		1.0	1.5	

4.3 4.3.1	Technical and protocols of communication satellital SCPC	1.0		1.0	1.5	

4.4
4.4.1
4.4.2
	Technical of localization satellital
	  GPS
	  Galileo
		1.0		1.0	0.5	

4.5
4.5.1
	Cards GPS and their software
	  Programming of interfaces for monitored of
	  Mobile systems
		1.0	0.5			

4.6	Practical applications		0.5			
	Subtotals:	4.0	1.0	4.0	3.5	

TEACHING PRINCIPLES

The present unit will be approached starting from the learning strategy guided to projects and deductive method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, resolution of problems, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION

Portfolio of Evidences:
Conceptual Map	5%
Cooperative Presentation	10%
Report of Practical	20%
Advance of project	30%
Rubric of Self-Evaluation	5%
Rubric of Co-Evaluation	5%
Learning Evidence	20%
Problem solving	5%

N° THEMATIC UNIT: V				**NAME:** Zig Bee Communication.

UNIT OF COMPETENCE

The student designs a communication system, based on a digital communication technology.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	**P**	**T**	**P**	

5.1
5.1.1
	Technical of communication mediating Zig Bee
	  Programming of the devices Zig Bee in way
	  Teacher and Slave
		1.5		2.0	3.5	9B,1C

5.2 5.2.1	Devices and programming Software Commands AT for programming of the device Zig Bee.	1.5	1.0	2.0		
5.3	Practical applications			2.0		
	Subtotals:	3.0	1.0	6.0	3.5	

TEACHING PRINCIPLES

The present unit will be approached starting from the learning strategy guided to projects and heuristic method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION

Portfolio of Evidences:
        Conceptual Map   10%
        Cooperative Presentation   10%
        Report of Practical   20%
        Advance of project   15%
        Rubric of Self-Evaluation   5%
        Rubric of Co-Evaluation   5%
        Learning Evidence   30%
         Problem solving   5%

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N° THEMATIC UNIT: VI   **TITLE:** Sensor Networks

UNIT OF COMPETENCE

The student designs a sensor network, based on network topology.

No.	CONTENTS	Teacher led-instruction HOURS		Autonomous Learning HOURS		REFERENCES KEY
		T	P	T	P	
6.1 6.1.1	Introduction to nets of sensors Topologies of nets used in nets of Sensors	1.0	0.5	2.0	3.5	7C, 9B
6.2 6.2.1	Design of a net of sensors Emulation of a net of sensors	1.0	0.5	2.0		
6.3	Implementation of a net of sensors			2.0		
	Subtotals:	2.0	1.0	6.0	3.5	

TEACHING PRINCIPLES

The present unit will be approached starting from the learning strategy guided to projects and heuristic method, what will allow the consolidation of the following learning techniques: rain of ideas, documental inquiry, directed discussion, conceptual maps, exhibition in team of complementary topics and realization of practical.

LEARNING EVALUATION

Portfolio of Evidences:
    Conceptual Map   10%
    Cooperative Presentation   10%
    Report of Practical   20%
    Project report   45%
    Rubric of Self-Evaluation   5%
    Rubric of Co-Evaluation   5%
    Problem solving   5%

SECRETARÍA ACADÉMICA

DIRECCIÓN DE EDUCACIÓN SUPERIOR

RECORD OF PRACTICES

PRACTICAL No.	NAME OF THE PRACTICE	THEMATIC UNITS	DURATION	ACCOMPLISHMENT LOCATION
1.	Communications systems.	I	4.5	Laboratories of Systems and Signs of ESCOM.
2.	Spectrum of frequency	II	4.5	
3.	Cellular Interfaces	III	4.5	
4.	GPS	IV	4.5	
5	Technology Zigbee	V	4.5	
6	Nets of sensors	VI	4.5	
		TOTAL OF HOURS	27.0	

EVALUATION AND VALIDATION:

The practical are considered mandatory to pass this unit of learning.
The practical worth 20% in each thematic unit.

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DIRECCIÓN DE EDUCACIÓN SUPERIOR

PERIOD	UNIT	EVALUATION TERMS
1	I y II	Continuous assessment 70% and written learning evidence 30%
2	III	Continuous assessment 70% and written learning evidence 30%
	IV	Continuous assessment 80% and written learning evidence 20%
3	V	Continuous assessment 70% and written learning evidence 30%
	VI	Continuous assessment 100%

Unit I   15% of the total of the final evaluation
Unit II   15% of the total of the final evaluation
Unit III   15% of the total of the final evaluation
Unit IV   15% of the total of the final evaluation
Unit V   15% of the total of the final evaluation
Unit VI   15% of the total of the final evaluation

The program will evaluate the students in a continuous formative and summative way, which will lead into the completion of learning portfolio. Some other assessing methods will be used, such as revisions, practical´s, class participation, exercises, learning evidences and a final project.

Other means to pass this Unit of Learning:
- Evaluation of acknowledges previously acquired, with base in the issues defined by the academy.
- Official recognition by either another IPN Academic Unit of the IPN or by a national or international external academic institution besides IPN.

If accredited by Special Assessment or a certificate of proficiency, it will be based on guidelines established by the academy on a previous meeting for this purpose.

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DIRECCIÓN DE EDUCACIÓN SUPERIOR

KEY	B	C	REFERENCES
1		X	Aggelou, G.(2008). *Wireless Mesh Networking*. London:Ed. Mc Graw Hill. ISBN 978-0071482561
2	X		Firtman, M. (2004). *Programación para Celulares Java.*Paraguay: Ed. User code. ISBN 987-526-227-7.
3	X		Hwei, P. H.(1998). *Análisis de Fourier*. México: Prentice Hall. ISBN 968 444 356 0.
4		X	Kolawole, M. O. (2002) *Satellite Communication Engineering.* USA: CRC Press. ISBN 082470777X.
5	X		Oppenheim, A. V. Willsky, A. S. Hamid, N. (1998). *Señales y Sistemas.* (2a. Ed.). México: Prentice Hall ISBN 0-13-814757-4.
6		X	Pareek, D. (2006). *Business Intelligence for Telecomunication*. USA: Auerbach Publishing. ISBN 0849387922.
7		X	Raghavendra, K. M. (2004). *Wireless Sensor Networks*. USA: Springer Science+ Business Media, Inc. ISBN 1-4020-7883-8.
8		X	Taylor, G. Blewitt, G. (2006). *Intelligent Positiong.* USA:Wiley John Wiley and Sons. ISBN 0470850035
9	X		Tomasi, W. (2003). *Sistemas de Comunicaciones Electrónicas.* (4ª. Ed). México:Prentice Hall. ISBN 970-26-0316-1.

1. GENERAL INFORMATION

ACADEMIC UNIT: Escuela Superior de Cómputo.

ACADEMIC PROGRAM: Ingeniería en Sistemas Computacionales.　　**LEVEL**　III

FORMATION AREA:

Institutional	Basic Scientific	Professional	Terminal and Integration

ACADEMY: Sistemas Distribuidos.　　**LEARNING UNIT:** Mobile Communications.

SPECIALTY AND ACADEMIC REQUIRED LEVEL: Master in Engineering of Telecommunications or Master in Mobile Computation.

2. AIM OF THE LEARNING UNIT:
The student evaluates the use of different communication technologies, based on radiofrecuency signal propagation models.

3. PROFESSOR EDUCATIONAL PROFILE:

KNOWLEDGE	PROFESSIONAL EXPERIENCE	ABILITIES	APTITUDES
• Knowledge of the standards and technologies of wireless communication • Knowledge fo communication protocols in guided means and not guided. • Total knowledge of the analysis of Fourier • Knowledge of Analogical and digital communication Systems. • Knowledge of norms and protocols in systems of communication satelital (Teleports).	• Two year experience on Projects of Cellular Systems Communication (Courses and Projects) • One year experience on field of Teleports for communication satelital. • One year experience as facilitator in Higher Education.	• Capacity to express ideas correctly in an oral and written way • Capacity to revise code of programs, to detect and to correct errors • Easiness for the handling of groups • To apply the educational process of MEI	• Responsible. • Tolerant. • Honest. • Respectful. • Collaborative. • Participative. • Interested to learning. • Assertive.

DESIGNED BY	REVISED BY	AUTHORIZED BY
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Date: 2011