SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
12	Faculty	Faculty of Electronics, Telecommunications and
1.2		Information Technology
1.3	Department	Communications
1.4	Field of study	Electronics and Telecommunications Engineering
1.5	Cycle of study	Bachelor of Science
16	Program of study/Qualification	Telecommunications Technologies and
1.0	Frogram of study/Qualification	Systems/Engineer
1.7	Form of education	Full time
1.8	Subject code	TST-E36.00

2. Data about the subject

2.1	Subject name			Modulation Techniques				
2.2	Subject area			Electronics and Telecommunications Engineering				
2.3	Course responsible/lecturer			Prof. Vasile Bota, Ph.D				
2.4	Teachers in charge of applications			Prof. Vasile Bota, Ph.D, Anghel Botos, PhD				
2.5 Year of			2.6	I	2.7	Examination	2.8 Subject	compul
study		111	Semester	1	Assessment		category	sory

3. Estimated total time

3.1 Ni	umber of hours per week	5	3.2 of w	hich, course:	2	3.3 applications:	3
3.4 To	otal hours in the curriculum	70	3.5 of w	hich, course:	28	3.6 applications:	42
Indivi	idual study						hours
Manual, lecture material and notes, bibliography						36	
Supplementary study in the library, online and in the field					4		
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					11		
Tutoring						4	
Exams and tests 5						5	
Other activities					0		
3.7 Total hours of individual study 60						• •	
3.8 Total hours per semester 130							
3.9 Number of credit points 5							

4. Pre-requisites (where appropriate)

4.1	Curriculum	Not applicable
4.2	Competence	Basic knowledge of signal theory; basic knowledge of digital circuits

5. Requirements (where appropriate)

5.1	For the course	Downloading of the lecture notes -available on the course's website
5.2	For the applications	Downloading and study of some laboratory notes - available on the course's website

6. Specific competences

Professional competences	 C4. To design, implement and operate data, voice, video and multimedia services, based on the understanding and application of fundamental concepts from the field of communications and information transmission. C5. To select, install, configure and exploit fixed and mobile telecommunications equipment. To equip a site with common telecommunications networks. C6. To solve wide-band telecommunications networks' specific problems: propagation in various transmission media, high frequency circuits and equipment (microwaves and circuit).
Cross competences	N.A.

7. Discipline objectives (as results from the key competences gained)

7.1	General objective	Development of professional competences in the area of emplyment, design, simulation and performance evaluation of the studied modulation techniques in transmission systems.	
7.2	Specific objectives	 Assimilation of theoretical knowledge regarding the structure, design, simulation, performance evaluation and applicability of the modulation techniques studied Acquiring the skills and abilities to use transmission measurement and analysis equipment. Acquiring the elementary skills and abilities to implement and evaluate the performance of the modulation techniques by using advanced simulation tools 	

8. Contents

8.1. L	ecture (syllabus)	Teaching methods	Notes
1.	Linear Modulations (LM) I. Types of LM. Quadrature Amplitude Modulation (QAM). Expression and spectra of the LM signals. Modulation methods of the LM signals.	Exposition, discussions	Video- projector, employment of the lecture
2.	Linear Modulations (LM) II. LM receivers. Demodulation methods of the LM signals.		notes available on

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	Biblio	graphy	

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Т	ehnică din Cluj-Napoca, <u>http://users.utcluj.ro/~dtl/TM/cursuri</u>	<u>tm.html</u>				
8.2. /	Applications/Laboratory	Teaching methods	Notes			
1.	Introduction. Basic notions of signals' theory - revision					
2.	Linear Modulations I. Spectral composition. Transmission.					
3.	Linear Modulations II. Demodulation. Carrier recovery. SNR performance.					
4.	Frequency Modulation. Modulation. Demodulation. SNR performance.	Configuration	Computers,			
5.	Base-band Data Transmissions I. BB codes.	of advanced	advanced software simulation tools, experimental laboratory circuits, specific measuring equipment			
6.	Base-band Data Transmissions II. Digital synchronization of the bit-clock	simulators, performing				
7.	Filtering of data signals.	measurement				
8.	PAM. ASK	s and the				
9.	PSK I. Transmitter. Receiver.	of the results				
10.	PSK II. Error performance of PSK	obtained.				
11.	A+PSK I. Transmitter. Receiver.	Case studies.				
12.	A+PSK II. Local carrier synchronization. Error probability of A+PSK. Comparison to the performance of PSK.and ASK					
13.	FSK.I Spectrum. Transmitter					
14.	FSK II Receiver. Bit-clock synchronization. Bit-error probability.					
8.3 A	pplications/Seminar					
1.	Linear modulations		Sets of			
2.	Frequency modulation		problems			
3.	Baseband transmissions		the			
4.	PAM and ASK	Solving	laboratory			
5.	PSK	Case studies	site:			
6.	A+PSK		http://users.u			
7.	FSK		<u>M/seminar_t</u> m.html			
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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The acquired competences would be useful to the employees in the following possible jobs, according to COR: Transmission engineer, Electronics, transportation, telecommunications engineer, R&D Electronics engineer, Computer networks design Communications design engineer, Sales support engineer, Multimedia applications developer, Network operation engineer, Communications systems testing engineer, Project manager, Traffic engineer, Consultant in communications systems

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade			
Course	Solving 4-5 subjects (problems+theory) (3 hours)	Written examination	75%			
Applications 3 written tests to evaluate the knowledge acquired in the lab works		Evaluation during the semester	25%			
10.4 Minimu	10.4 Minimum standard of performance					
The final mark (N) is composed of the exam score (E) and the arithmetic average of the lab tests' scores (L). The final mark N will be computed by rounding the weighted score P = $0.75*E+0.25*L$, by N = [P+0.5], provided that: P ≥ 5 and E ≥ 5, these being the condition to pass the exam.						

Date of filling in 01.10.2014 Course responsible Professor Vasile BOTA, PhD Teachers in charge of applications Professor Vasile BOTA, PhD Anghel BOTOS, PhD

Date of approval in the department 01.10.2014 Head of Communications Department Professor Virgil DOBROTA, PhD