SYLLABUS

Discipline name	Radiocommunications
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51324209
Course leader	Professor Tudor Palade, Ph.D – Tudor.Palade@com.utcluj.ro
Collaborators	Assistant Nicolae Crisan – Nicolae.Crisan@com.utcluj.ro
Department	Communications
Faculty	Electronics, Telecommunications and Information Technology

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/semester]							
			S	L	P		S	L	P				
6	**Speciality**	**2**	**-**	**2**	**1**	**28**	**-**	**28**	**14**	**80**	**150**	**5**	**Exam**

Acquired competences :

Acquired skills (what the student is able to do):

- characterize the behavior of the RF circuits
- compute the parameters of the systems using appropriate tools
- interpret and set up the RF equipment parameters
- use RF electronic devices in different operating regimes;
- determine the operating regime of RF devices;
- determine the performances of RF simple electronic circuits;
- use the basic applications of RF devices: AM and FM broadcasting, radiocommunication fixed links under different standards

Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):

- study experimentally RF circuits and systems
- to develop design projects using software tools
- use the lab instrumentation (power supplies, oscilloscope, function generator, multi-meter) for the experimental study of simple RF circuits
- gather and analyze the numerical data obtained through the explorations
- experimentally determine the broadcasting transmitters and receivers characteristics
- experimentally determine the parameters of several radiocommunications systems (gain, transmitted and received power, signal to noise ratio, etc)

Prerequisites (if necessary):

Knowledge about microwave devices and circuits, electronic devices, integrated circuits, signals and systems.

A. Course/Lecture (course/lecture titles)	
1	Serial and paralel rezonance, Q factor, resonant circuits, channel bandwidth.
2	Low signal radio frequency amplifiers – designs techniques and analysis.
3	Serial and parallel coupling circuits, transformer coupling.
4	Hartley, Colpitts and Clapp oscillators' analysis, in and out tuned oscillators.
5	Untuned oscillators, oscillator's stability and spectral accuracy, quartz oscillators.
6	Power RF amplifiers, neutrodyne, CI and RF amplifiers, adaptive circuits.
7	AM modulating circuits.
8	Low noise amplifiers, mixers, FI amplifiers, AGC detectors and circuits.
9	Broadband FM and PM, VCO, multipliers, stereo emission.
10	FM detectors: flank, phase, ratio, quadrate, PLL demodulator, stereo reception.
11	DECT radio communications system: TDD and TDMA-TDD, DECT frame, protocol architecture.
12	WLL – Wireless Local Loop: propagation overview, OFDM, MMDS, LMDS.
13	Fix wireless broadband access - IEEE 802.16: architecture and services, physical and MAC layers.
14	802.11 standards: architecture and services, physical and MAC layers.

B. Applications – Laboratory (list of laboratories)	
1	Antennae used in radio communications.
2	Radio frequency lines.
3	RF amplifiers.
4	RF oscillators.

5	RF mixers.
6	High power RF amplifiers. Generators.
7	Frequency synthesis.
8	VHF/UHF Transceiver and transverter.
9	Stereo radio systems.
10	Broadband radio communication systems.
11	Broadband radio planning networks.
12	DSSS radio communications and Bluetooth systems.
13	GPS system.
14	Radio frequency measurements.

	Project (project contents)
1	Frequency synthesis using PLL.
2	RF mixers.
3	Microstrip antennae.
4	Radio channel modeling using SIMULINK.
5	OFDM- MATLAB simulation.
6	Minimizing ICI in OFDM.
7	Thermal noise modeling.
8	MIMO systems.
9	Improving RF oscillator parameters.
10	Cognitive receivers

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)

2 synthesis reports
3 sets of problems (course homework)

Individual study structure	Course study	Problem solving, laboratory, project	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	13	28	3	8	80

References (Textbooks, courses, laboratory manual, exercise book)

1. Marinescu, N. – Radioreceptoare cu circuite integrate, Ed. Tehnica, Bucuresti, 1985.
2. Cipere, L., s.a. – Lucrari practice de depanare a radioreceptoarelor, Ed. Tehnica, Bucuresti, 1985.
3. Nicolau, Ed.- Manualul inginerului electronist- Radiotehnica I, II, III- Ed. Tehnica,′89, ISBN 973-31-0116-8
4. Mihalcea, A. – Sisteme moderne de comunicatii, Ed. Militara, Bucuresti, 1992, ISBN 973-32-0179-0
5. Feher, K. – Comunicatii digitale avansate, Vol. I si II, Ed. Tehnica, Bucuresti, 1993, ISBN 973-31-0526-0
6. Palade, T. – Tehnica microundelor, Genesis, Cluj-Napoca, 1997, ISBN 973-98204-3-3.
7. Baican, R. – Circuite integrate de microunde – Promedia Plus, Cluj-Napoca, 1998, ISBN 973-97377-6-5.
8. Palade, T., s.a. -Radiocomunicatii. Indrumator de laborator, Ed. Mediamira, ′99, Cluj, ISBN 973-97791-2-3
9. Palade, T., s.a. – Radiocomunicatii. Culegere de probleme, Ed. Mediamira, ′99, Cluj, ISBN 973-97790-9-3
10. Remete, I. – Antene pentru unde ultrascurte şi TV-DX, Ed. Tehnică, Bucuresti, 2000, ISBN 973-31-1285-2
11. Palade, T. – Radiocomunicatii celulare, Ed. Mediamira, Cluj-Napoca, 2001, ISBN 973-9358-35-7
12. Astilean, A. – Comunicatii fara fir, Ed. Mediamira, Cluj-Napoca, 2006, ISBN 973-713-111-8
13. Marza, E. – Radiocomunicatii, Ed. de Vest, Timisoara, 2007, ISBN 973-36-0374-0.

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Laboratory (L: 0…10 points); Project (P: 0…10 points);
Mark computation	M = 0.6E + 0.2L + 0.2P. Pass if: E≥4 and L≥4 and P≥4 and M≥4.5

Course leader,

Professor Tudor PALADE, Ph.D.

_____