

SYLLABUS

Discipline name	Microwaves
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51322509
Course leader	Professor Tudor Palade, Ph.D – Tudor.Palade@com.utcluj.ro
Collaborators	Assistant Ligia Cremene – Ligia.Cremene@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								
4	Mandatory	2	-	2	-	28	-	28	-	94	150	5	Exam				

Acquired competences :
Acquired skills (what the student is able to do):
<ul style="list-style-type: none"> characterize the behavior of the microwave devices compute the parameters of the microwave systems interpret the measurement equipment outputs use electronic devices in different operating regimes: determine the operating regime of electronic devices; design simple passive and active microwave determine the performances of designed microwave circuits; use the basic applications of microwave devices;
Acquired abilities (what type of equipment/ instruments/ software the student is able to handle):
<ul style="list-style-type: none"> study experimentally microwave circuits ability to use numerical data form experiments develop design projects using specific software tools use the lab instrumentation (power supplies, oscilloscope, spectrum analyzer, RF generator, powermeter) for the experimental study microwave circuits experimentally determine the couplers and dividers characteristics experimentally determine the amplifiers and oscillators behavior experimentally determine the S-parameters of several circuits and devices.

Prerequisites (if necessary):
Mathematics, Physics, Electromagnetic theory, Passive and active electronic devices, Circuits theory.

A. Course/Lecture (course/lecture titles)	
1	Transmission lines theory
2	Waves in transmission lines and waveguides
3	Rectangular waveguides
4	Coaxial line
5	Stripline and Microstrip lines
6	Impedance adaptation and tuning
7	L circuits tuning
8	Serial and parallel resonant circuits
9	Power divider and coupler properties
10	Waveguide line couplers
11	Isolators
12	The noise in microwave circuits
13	Oscillators
14	Amplifiers

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B. Applications – Laboratory (list of laboratories)	
1	Microwave software simulation tool – Mefisto 2D and 3D
2	Microwave propagation in transmission lines.
3	Microwave propagation in rectangular waveguide transmission lines.
4	Propagation modes analysis in rectangular waveguide transmission lines.
5	Microstrip technology and microwave circuits.
6	Amplitude-frequency and attenuation-frequency dependency in microwave devices.
7	Directional coupler parameters.
8	The magnetron. Microwave Oven.
9	Analysis and design of transistor microwave amplifiers. Microstrip line dimensioning.
10	Analysis and design of microwaves oscillator.
11	Free space microwave propagation (diffraction and interference).
12	Propagation models for microwaves.
13	Wireless systems – microwave applications.
14	Industrial microwave applications.

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	11	28	3	24	94

References (Textbooks, courses, laboratory manual, exercise book)	
1.	Palade, T., s.a. – Tehnica Microundelor. Indrumator de laborator, IPC-N, 1988.
2.	Nicolau, Ed. - Manualul inginerului electronist–Radiotehnica I, II, III- Ed.Tehnica, '88, ISBN 973-31-0116-8
3.	Palade, T. – Tehnica Microundelor. Culegere de probleme, UTC-N, 1992.
4.	Collin, R.E. – Foundations for microwave engineering – Ed. McGraw-Hill, 1992.
5.	Elliott, R.– An introduction to guided waves and microwave circuits – Prentice 93
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.	Cantaragiu, S. - Circuite de microunde, Ed. All, Bucuresti, 2000, ISBN 973-684-165-0.
9.	Stefan, A. - Simularea asistata a circuitelor de microunde, Ed. Albastra, Cluj-N, 2000, ISBN 973-9443-52-4
10.	Gavriloaia, G. Analiza numerica a campului de microunde, Ed. Teora, Bucuresti, 2001, ISBN 973-20-0686-2
11.	Lojewski, G. - Dispozitive si circuite de microunde, Ed. Tehnica, Bucuresti, 2005, ISBN 973-31-2263-7
12.	Palade, T., Crişan, N., Puşchiţă, E., Cremene, L.,- Microunde lucrari de laborator – Vol 1, Ed. UTPRESS, Cluj-Napoca 2008, ISBN 978-973-662-377-6
13.	Naformita, M., Naformita, I. – Microunde – Fundamente – Ed. Politehnica, Timisoara 2006, ISBN 973-625-347-3

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); Homework (H: 0...10 points);
Mark computation	$M = 0.6E + 0.2L + 0.2H$. Pass if: $E \geq 4$ and $L \geq 4$ and $M \geq 4.5$

Course leader,

Professor Tudor PALADE, Ph.D.
