

SYLLABUS₁

1. Information about the program

1.1 Higher education institution	POLITEHNICA UNIVERSITY TIMISOARA
1.2 Faculty ₂ / Departments ₃	ELECTRONICS AND TELECOMMUNICATIONS / MEASUREMENT AND OPTICAL ELECTRONICS
1.3 Chair	—
1.4 Field of study (name/code ₄)	ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING / 100
1.5 Study cycle	LICENSE
1.6 Study program (name/code)/Qualification	TELECOMMUNICATIONS TECHNOLOGIES AND SYSTEMS

2. Information about the discipline

2.1 Name of discipline	High Frequency Techniques						
2.2 Coordinator (holder) of course activities	Aldo De Sabata						
2.3 Coordinator (holder) of applied activities ₅	Cora Iftode						
2.4 Year of study ₆	3	2.5 Semester	5	2.6 Type of evaluation	Exam	2.7 Type of discipline	Obl

3. Total estimated time (hours / semester of didactic activities)

3.1 No. of hrs. / week	4 , of which:	3.2 course	2	3.3 seminar/laboratory/ project/training	2
3.4 Total no. of hrs. in the education curricula	56 , of which:	3.5 course	28	3.6 applied activities	28
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					10
Additional documentation in the library, on specialized electronic platforms and on the field					7
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					10
Tutoring					2
Examinations					6
Other activities					
Total hrs. of individual activities					35
3.8 Total hrs. / semester ₇	91				
3.9 No. of credits	4				

4. Prerequisites (where applicable)

¹ The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).

² The name of the faculty which manages the educational curriculum to which the discipline belongs.

³ The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.

⁴ Fill in the code provided in GD no. 493/17.07.2013.

⁵ The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

⁶ The year of study to which the discipline is provided in the curriculum.

⁷ It is obtained by summing up the number of hrs. from 3.4 and 3.7.

4.1 Curriculum	<ul style="list-style-type: none"> Electrical circuits in harmonic steady state; Electromagnetic Field (Basics)
4.2 Competencies	<ul style="list-style-type: none">

5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> Printed version of lecture notes;
5.2 to conduct practical activities	<ul style="list-style-type: none"> Laboratory provided with general purpose and high frequency instrumentation Computers running Matlab available

6. Specific competencies acquired

Professional competencies [§]	<ul style="list-style-type: none"> Aptitude to apply and use fundamental elements of electronic devices, circuits, systems, instrumentation and technology Conception, implementation and operation of data, voice, video and multimedia services based on understanding and application of fundamental concepts of the fields of communications and information transmission Selection, installation, configuration and operation of fixed and mobile telecommunications equipment and provision of a location with usual telecommunications equipment Solving specific problems of wideband telecommunications networks: propagation in various transmission media, circuits and equipment for high frequencies (microwaves and optic)
Transversal competencies	<ul style="list-style-type: none"> Methodical analysis of common problems met in activity by identification of elements that admit known solutions, ensuring in this way fulfilment of professional assignments Adaptation to new technologies, professional and personal development by continuous formation, relying on printed documents, dedicated software and electronic resources in Romanian and in at least one foreign language

7. Objectives of the discipline (based on the grid of specific competencies acquired)

7.1 General objective of the discipline	<ul style="list-style-type: none"> Acquiring competences concerning the operation and design of modern high frequency equipment for Applied Electronics and Telecommunications and preparation for understanding of relevant phenomena and issues related to Electromagnetic Compatibility
7.2 Specific objectives	<ul style="list-style-type: none"> Knowledge of propagation of the electromagnetic field on transmission lines and solutions to issues concerning interconnection of high frequency equipment and transmission lines Knowledge of construction of main types of modern transmission lines, their parameters and the corresponding configuration of the electromagnetic field Design of simple and conjugate matching circuits Understanding characterization of high frequency devices and circuits by means of S parameters Understanding propagation of pulses on transmission lines Design of high frequency, unilateral amplifiers

[§] The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Național al Calificărilor din Învățământul Superior RNCIS] (http://www.rncis.ro/portal/page?_pageid=117_70218&_dad=portal&_schema=PORTAL) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

	<ul style="list-style-type: none"> • Understanding issues concerning design of printed circuit boards for high frequency applications by taking into account propagation effects
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8. Content

8.1 Course	No. of hours	Teaching methods
Transmission Lines	10	Lectures based on overhead projectors, whiteboard elaboration and calculations and interaction with audience by question and answers sessions
Normalization and the Smith Chart	4	
Power Transfer on Transmission Lines	4	
S Parameters and Applications	6	
Time Domain Reflectometry on Transmission Lines	4	
Bibliography ⁹ Aldo De Sabata, <i>High Frequency Techniques</i> , Lecture Notes on digital support, 2012 R. E. Collin, <i>Foundations for microwave engineering</i> , McGraw-Hill, New York, 1992 D. M. Pozar, <i>Microwave Engineering</i> , Second edition, John Wiley and Sons, New York, 1998		
8.2 Applied activities ¹⁰	No. of hours	Teaching methods
Measurement of the Standing Wave Pattern	2	Hands-on practical work and problem solving including Smith Chart Applications
Microwaves Power Measurement	2	Hands-on
Frequency Measurement in the Microwaves Range	2	Hands-on

⁹ At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.

¹⁰ The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:“, „Laboratory:“, „Project:“ and/or „Practice/Training:“.

Microwaves Doppler Radar	2	Hands-on
Horn Antennas Measurement	2	Hands-on
Design of Simple Matching Circuits	4	Smith Chart and problem solving
Design of Conjugate Matching Circuits	4	Smith Chart and problem solving
Design of Unilateral Amplifiers with one Tranzistor	6	Smith Chart and problem solving
Time Domain Reflectometry	4	Hands-on and problem solving

Bibliography ¹¹ Aldo De Sabata, *High Frequency Techniques*, Lecture Notes on digital support, 2012

R. E. Collin, *Foundations for microwave engineering*, McGraw-Hill, New York, 1992

D. M. Pozar, *Microwave Engineering*, Second edition, John Wiley and Sons, New York, 1998

Agilent Application Notes

Sivers Labs Application Notes

Contents of practical work is available for students in digital format

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- The importance of High Frequency Techniques is constantly increasing due to increase of the speed of circuits, widespread of wide-band communications, space technology and tightening of regulations concerning electromagnetic emissions and immunity
- Many technology-driven multinational companies are present in the region of Timisoara, which act in the field of Electronics and Telecommunications and which are the main employers for our graduates. High Frequency Techniques are widely applied within these companies.
- Cooperation with engineers that work with these companies in the field of Electromagnetic Compatibility is an opportunity for a continuous update of the syllabus.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Aptitude to demonstrate the acquired knowledge on four theoretical questions and two problems to be solved	Written examination	66%
10.5 Applied activities	S:		
	L: Aptitude to use high frequency instrumentation, to rely on the Smith Chart for design and problem solving	Two written tests and supervision of practical work and processing of data	34%

¹¹ At least one title must belong to the staff teaching the discipline.

	P:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified)			
<ul style="list-style-type: none"> • Elementary knowledge on the construction and parameters of transmission lines and on phenomena that take place on the lines • Elementary knowledge on impact of high frequency phenomena on instruments and printed circuit boards • Basic understanding of S parameters • Aptitude to perform very simple high frequency measurements • Knowledge is verified through basic requirements for the written examination and laboratory assessment 			

Date of completion

Course coordinator
(signature)

Coordinator of applied activities
(signature)

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Head of Department
(signature)

Date of approval in the Faculty Council¹²

Dean
(signature)

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¹² Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparține programul de studiu cu privire la fișa disciplinei.