Poznan University of Technology
Faculty of Electronics and Telecommunications

European **C**redit **T**ransfer **S**ystem

STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Circuits Theory**	Code **1010804121010840063**

Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**

Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**

Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**

No. of hours	No. of credits
Lecture: **30** Classes: **30** Laboratory: **-** Project/seminars: **-**	**7**

Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **university-wide**

Education areas and fields of science and art
 	
technical sciences
   Technical sciences
	ECTS distribution (number and %**)**
	
	7 100%
	      7 100%

Responsible for subject / lecturer:	Responsible for subject / lecturer:
Prof. dr hab. inż. Wojciech Bandurski email: wojciech.bandurski@put.poznan.pl tel. 061 665 3848 Wydział Elektroniki i Telekomunikacji ul. Piotrowo 3A 60-965 Poznań	mgr inż. Jakub Stankowski email: jstankowski@multimedia.edu.pl tel. 061 665 3894 Wydział Elektroniki i Telekomunikacji ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra. Has a basic, structured knowledge of physics.
2	**Skills**	Can apply the vector analysis in three basic systems of coordinates. Can solve simple circuits with lumped and distributed parameters in the steady state and transient.
3	**Social competencies**	Knows the limits of his own knowledge and abilities, understands the need for ongoing education

Assumptions and objectives of the course:

Understanding of electromagnetic phenomena in circuit components and networks as objects transfering energy and signals. Ability to describe these phenomena and to analyze the circuit in order to get knowledge and for the practical needs of the research and design of electronic and telecommunications systems.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knows basic laws in circuit theory: voltage and current Kirchoff - [K_W05]

2. Knows the characteristics and basic branch equations of linear elements and typical non-linear elements. - [K_W05]

3. Knows the basic circuit analysis methods including elements of numerical methods. In particular is familiar with method of complex numbers and the method of Laplace transform. - [K_W05]

4. Knows the two-port description of circuit using a matrices Z, Y, H, A, and S. Understands the concepts: transfer function, amplitude and phase characteristics. Elemental understanding the concept of the stability of the circuit: the equilibrium point, trajectory, points of impasse in the circuits of the first order. Knows the basis of the synthesis of lossless one-ports and two-ports. - [K_W05]

Skills:

1. Can take the information from the literature and databases, and other sources in Polish or English; able to integrate the information, make their interpretation, draw conclusions and justify opinions - [K_U01]

2. Can solve common tasks and problems associated with the analysis of electrical circuits. - [K_U09]

3. Calculates the elements of the two-port matrices and transfer function of the system. Knows how to analyze the dynamics of a simple piecewise-linear circuit. - [K_U09]

4. Knows how to perform synthesis of the lossless one-port and the simple cases of lossless two-port. - [K_U09]

Social competencies:

1. Able to self-learning (textbooks, computer programs) - [K_K01]

2. Behaves actively in class, asks questions, knowingly uses the contact with the teacher (eg consultation). - [K_K03]

Assessment methods of study outcomes

1 Written examinations and test questions

2 Problem solving tests (written tests) at classes

3 Housework

Course description

? Basic laws in circuit theory: voltage and current Kirchoff's laws, Tellegen?s theorem. Real circuit and its mathematical model.

? Linear and non-linear passive components and active elements of analog circuits. The basic principles, theorems and methods in the analysis of resistive circuits.

? Circuits with harmonic currents in steady state - Method of complex numbers, phasor diagrams. Coupled and resonant circuits.

? Linear circuits with periodic signals.

? Transients, analysis in time and frequency domain (LapLace transform). Two-ports and their description using the matrices: Z, Y, H, A, etc., and S.

? The concept of transfer function, amplitude and phase characteristics.

? Basic concepts of circuits stability: equilibrium points, trajectory, points of impasse in the circuits of the first order.

? The synthesis of lossless one-port and two-port networks.

Basic bibliography:

1. Podstawy teorii obwodów. Tom 1,2,3, J.Osiowski, J.Szabatin, WNT, Warszawa, 1992, 1995, 2000.

2. Obwody i układy, A.Papoulis , WKŁ, Warszawa, 1988

3. Zbiór Zadań z Teorii Obwodów. Część 1/2. , J. Szabatin, E. Śliwa , Wyd. PW, Warszawa, 2003

Additional bibliography:

1. Circuits Systems with Matlab and PSpice, Won Y. Yang, Seung C. Lee, Wiley, Asia, 2007.

2. Linear and Nonlinear Circuits, L.O. Chua, C.A. Desoer, E.S. Kuh , McGraw-Hill Inc., 1987.

3. Elektrotechnika teoretyczna - analiza i synteza elektrycznych obwodów liniowych, K. Mikołajuk, Z. Trzaska , PWN, Warszawa,1981.

4. Analog and digital filters: design and realization, H. Y.,-F. Lam , Prentice_Hall, Inc., Englewood Cliffs, New Jersey, 1979.

Result of average student's workload

Activity	Time (working hours)
1. Classes that require personal contact with an academic teacher	90
2. Preparations for the training (problem solving), development problems and preparation for written tests	40
	10
3. Reading of literature (textbooks, catalogs)	
4. Preparations for the examination	40

Student's workload

Source of workload	hours	ECTS
Total workload	180	7
Contact hours	65	4
Practical activities	70	3