COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	University POLITEHNICA of Bucharest
1.2 Faculty	Electronics, Telecommunications and Information Technology
1.3 Department	Electronic Technology and Reliability
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

2. Course identification information

2.1 Name of the course				Passive electronic components and circuits			
2.2 Lecturer				Prof.dr.ing. Ciprian Ionescu			
2.3 Instructor for practical activities				Sl.dr.ing. Bogdan Mihăilescu.			
2.4 Year of studies	II	2.5 Semester	3	2.6 Evaluation type	Exam	2.7 Course choice type	Compulsory

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	3,5	3.2 course	2	3.3 practical activities	2
3.4 Total hours in the curricula, out of which	49	3.5 course	28	3.6 practical activities	28

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	24
Supplemental documentation (library, electronic access resources, in the field, etc)	8
Preparation for practical activities, homeworks, essays, portfolios, etc.	12
Tutoring	
Examinations	0
Other activities	

3.7 Total hours of individual study	55
3.9 Total hours per semester	104
3. 10 Number of ECTS credit points	4

4. Prerequisites (if applicable)

4.1 curricular	Physics, Mathematical Analysis, Basic Electrotechnics
4.2 competence-based	Not needed

5. Requisites (if applicable)

5.1 for running the course	Not needed
5.2 for running of the	Not needed

applications	

6. Specific competences

Professional competences	C1. Using of fundamental elements that refer to the electronic devices, circuits and instrumentation C2. Application, in typical situations, of basic methods of signal acquisition and processing
Transversal competences	It is not the case

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	The objective of this course is preparing the future electronics engineers with the necessary knowledge of discrete and integrated passive components. The course has a great practical orientation regarding the characterization, designing, modeling, simulation, measuring and using electronic passive components according to the discrete and integrated technologies which represent the basics of manufacturing electronic products in the "high tech" field.
4.2 Specific objectives	Familiarizing the students with the most important types of linear passive components (resistors, capacitors and inductors) and non-linear (thermistors, varistors). Realizing measurements and experiments specific for these components. Familiarizing the students with the way to identify the specific information and data for passive components according to the data sheets. Using this information when choosing a component specific for a certain application. The study of passive components' behavior using simulation methods based on mathematical models and simulators of SPICE type..

8. Content

8.1 Lectures	Teaching techniques	Remarks
General properties of passive electronic components. General facts. Definitions. Classification. Characteristic quantities. Determining the parameter tolerances of electronic circuits as function of passive components tolerances. Determining the temperature variation coefficient of electronic circuits as function of passive components temperature variation coefficients. Determining the global tolerance of circuit parameters as function of passive components deviation. Thermal loading of passive components.	Teaching method is based on videoprojector slides simultaneously having the option to use the printed book as notes handout. Teaching Materials are: Books, problem books, other materials from course WEB site and on Moodle from UPB.	5 hours
Resistors Fixed resistors. Definition. Classification. Resistor characteristics. Internal noise of resistors. Maximum electric loading of resistors. Determining the maximum admissible values of electric quantities. Equivalent schematics. Resistor impedance as function of frequency. Description of the main types of resistors (braided, carbon film, thick and thin film, metal oxide, metallic foil). Resistive nets. Choosing the resistor type and determining its parameters as function of the used electronic circuit. Variable resistors (potentiometers). Definition. Classification. Potentiometer characteristics. Applications. Digital potentiometers (electronic). Nonlinear resistors. NTC and PTC thermistors, characteristics		7 hours

and applications. Varistors, characteristics and applications.		
Capacitors. Definition, classification. Capacitor parameters. Capacitor marking. Description of the main types of capacitors (ceramic, with paper, with polyester, with polystyrene, with polycarbonate, with polypropylene). Electrolytic capacitors. Variable capacitors. Equivalent schematics. Capacitor impedance as function of frequency. Maximum electric load of capacitors, in continuous and impulse regime. Choosing the type and determining the parameters of the capacitor to be used in an electronic circuit, as function of its parameters.		6 hours
Inductors. Definition, classification. Parameters. Inductor marking. Constructive structure. Equivalent schematics. Inductor impedance as function of frequency. Maximum electric load of inductors.		5 hours
Dedicated electronic components and circuits. Resistor as electric current sensor. Decoupling capacitors. Capacitors and inductors for net filtering. Shock inductors, ferrite pearls. Power capacitors. Decade dividers. Attenuators. RC filters. Terminations for transmission lines.		5 hours
Bibliography: P. Svasta, V. Golumbeanu, C. Ionescu, A. Vasile, Rezistoare, Editura Cavallioti, 2007. P. Svasta, V. Golumbeanu, s.a, Componente electronice pasive - probleme, editura Cavallioti, 2009. P. Svasta, V. Golumbeanu, Componente electronice pasive – Condensatoare, UPB, editura Cavallioti 2009. P. Svasta, V. Golumbeanu, s.a, Componente electronice pasive –întrebări şi răspunsuri, UPB, 1996. R. Ulrich, L. Schaper, Integrated Passive Component Technology, John Wiley & Sons, USA, Canada, 2003. C. Kaiser, The Resistor Handbook, CJ Publishing, Olathe, USA, 1998. F. Zandman, P. Simon, J. Szwarc, Resistor Theory and Technology, Vishay Intertechnology, U.S.A., 2001. C. Harper, Passive Electronic Component Handbook, McGraw-Hill, New York, 1997. www.cetti.ro http://electronica.curs.pub.ro/2016/course/index.php?categoryid=26		
8.2 Practical applications	Teaching techniques	Remarks
Linear resistors	Oral exposure of about 20-25min. of the current laboratory work.	3 hours
Capacitors		3 hours
Nonlinear resistors – thermistors, varistors		3 hours
Inductors		3 hours
Simulation of resistive and capacitive structures		3 hours
Simulation of nonlinear resistive structures		3 hours
Final lab examination (colloquy)		3 hours
Bibliography: 1)P. Svasta, V. Golumbeanu, s.a, Componente electronice pasive - probleme, editura Cavallioti, 2009. 2) Course WEB page: http://www.cetti.ro/download		

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

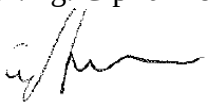
The designer of electronic devices, for realizing a professional product, has to understand well

each electric and non-electric component which is being used. In order to use a component according to its features, a first necessary condition is that the user should have basic knowledge about it.
The performances of the passive components are being improved permanently. We can say that the precision and stability of passive components have improved 100 times in the last 20 years. A metal film resistor has a thermal stability of only ±10ppm/deg. and a time stability of ±500ppm/deg. In the last years, the consumption of passive components has known an endless increase. In the same time with the developing of integrated circuits which have became more and more sophisticated, the number of passive components necessary to be interconnected with the integrated circuits has become larger and larger.
Passive components are present in every electronic applications, from consumer products (digital cameras, mobile terminals), automotive electronics and medical electronics. The course syllabus is appropriate to actual development and evolution trends, being connected to novelties and technological achievements in the field of electronic components and devices.
From direct discussion with representatives from companies as Infineon and Continental it has result that during employment interviews they require from candidates and do appreciate the right choosing of components for a certain application. In the same direction, the President of ARIES-Romanian Association for Electronics Industry and Software, the largest Association in this field from Romania does appreciate the knowledge transferred to students at this course.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- theoretical knowledge of fundamentals concepts about passive electronic components parameters. - knowledge about the application of theoretical concepts to practical problem solving.. - comparative analysis and differential choosing of a component dedicated to a specific application.	Problem solving tests 10% Final Verification (oral exam) 30%	40%
10.5 Practical applications	Practical knowledge of passive components parameters and identification of them from data sheets. Measurements and simulation in the laboratory works. Preparation of laboratory reports (papers).	Final laboratory test 30% that includes theoretical and practical verification. Laboratory Papers 15% Home work 15%	60%
10.6 Minimal performance standard			
Knowledge of the main parameters of passive components, qualitative interpretation. Nomination and differentiation of the parameters for the main used passive components. Performing of simple calculus about component tolerances, temperature coefficients, dissipated power in passive circuits.			

Date	Lecturer	Instructor for practical activities
25.09.2017	Prof.dr.ing. Ciprian Ionescu	Sl.dr.ing. Bogdan Mihăilescu



Date of department approval
26.09.2017

Director of Department,
Conf. Dr. Ing. Marian Vlădescu