Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti
Facultatea de Electronică, Telecomunicaţii şi
Tehnologia Informaţiei

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	**National University of Science and Technology Politehnica Bucharest**
1.2 Faculty	**Electronics, Telecommunications and Information Technology**
1.3 Department	**Applied Electronics and Information Engineering**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Applied Electronics

2. Date despre disciplină

2.1 Course name (ro) (en)				Calitate şi fiabilitate Quality and Reliability			
2.2 Course Lecturer				Conf. Dr. Iulian Nastac			
2.3 Instructor for practical activities				Conf. Dr. Iulian Nastac			
2.4 Year of studies	4	2.5 Semester	II	2.6. Evaluation type	V	2.7 Course regime	Ob
2.8 Course type		S	2.9 Course code	04.S.08.O.003		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	2	Out of which: 3.2 course	1.00	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	28.00	Out of which: 3.5 course	14	3.6 seminary/laboratory	14
Distribution of time:					hours
Study according to the manual, course support, bibliography and hand notes Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					20
Tutoring					0
Examinations					2
Other activities (if any):					0

3.7 Total hours of individual study	22.00
3.8 Total hours per semester	50
3.9 Number of ECTS credit points	2

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Attending the following courses: Special mathematics, Chemistry, Physics, Passive and active electronic components, Electronic systems and circuit design, Decision and estimation in information processing

4.2 Results of learning	Fundamental concepts of probability theory and mathematical statistics

5. Necessary conditions for the optimal development of teaching activities (where applicable)

5.1 Course	Room equipped with a video projector
5.2 Seminary/ Laboratory/Project	Room equipped with computers and specific software, Internet access

6. General objective *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

This discipline is studied in the field of Electronic Engineering, Telecommunications and Information Technology, Applied Electronics specialization. In this regard, it aims at teaching students about the use of tools and methods to assess and improve the quality and reliability of a technical system, taking into consideration the fundamental principles of total quality management. The course covers a variety of topics starting from essential terminology and definitions, in the field of quality engineering, up to tools and strategies used to increase customer satisfaction and the market share of a company. Considering the importance of developing applicable skills, practical problems and real life case studies will be presented and discussed.

7. Competences *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

Specific Competences	• List and describe the fundamental concepts of quality and reliability with respect to a specific product or system. • Apply different methodologies to help increase the quality of a product. • Examine the needs of the customer, so the final product better fits its needs. • Ability to transform customer requirements into technical specifications. • Analyze how quality can be improved in a company. • Applying statistical process control methods for monitoring of technological processes. • Elaboration of acceptance sampling plans. • Work with standards and concepts of quality assurance at a basic level.

Transversal (General) Competences	• Attempting synergy between scientific methods and corporate culture. • A total quality approach of technical and business processes. • Applying concurrent engineering methodology to different types of activities. • Develop attention to detail which is important in the procedure of product quality assurance, as well as in process assessment. • Improve critical thinking and problem-solving skills which are required in approaching quality engineering problems. • Build an ethical approach of working to ensure that the products are held to high standards to increase customer satisfaction and market share.

8. Learning outcomes *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

Knowledge	*The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.* • Define the fundamental concepts of quality and reliability. • Explain the consequences of non-quality and non-conformity. • Recognize and compare the key points from the philosophies of Deming, Crosby, Juran and Taguchi. • Apply fundamental concepts of statistics to evaluate the quality and reliability of a technical system. • Use computational methods to determine reliability indicators, as well the reliability of a system. • Use tools to transform client needs into technical specifications and improve quality. • Apply graphical methods to visualize and interpret data. • List the basic concepts of control diagrams, as well as presenting their characteristics. • Identify popular standards and describe how they contribute to the process of quality improvement. • List and present the function of the institutions which are involved in the process of standardization and quality assurance. • List and describe the main steps of audit process.

Skills	*The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).* • List and describe the fundamental concepts of quality and reliability with respect to a specific product or system. • Apply different methodologies to help increase the quality of a product. • Examine the needs of the customer, so the final product better fits its needs. • Ability to transform customer requirements into technical specifications. • Analyze how quality can be improved in a company. • Applying statistical process control methods for monitoring of technological processes. • Elaboration of acceptance sampling plans. • Work with standards and concepts of quality assurance at a basic level.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* • Attempting synergy between scientific methods and corporate culture. • A total quality approach of technical and business processes. • Applying concurrent engineering methodology to different types of activities. • Develop attention to detail which is important in the procedure of product quality assurance, as well as in process assessment. • Improve critical thinking and problem-solving skills which are required in approaching quality engineering problems. • Build an ethical approach of working to ensure that the products are held to high standards to increase customer satisfaction and market share.

9. Teaching techniques *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

The teaching methods focus on combining the classical form of lecturing with sessions of interaction with the students to ensure the understanding of the discussed topics. PowerPoint presentations, as well as the black board will be used to facilitate the flow of information. At the beginning of each course, theoretical notions will be presented, followed by practical examples or case studies. Where necessary, numerical problems will be given, to complement mathematical formulas used in reliability engineering.

The laboratory subjects were decided based on the course structure to further develop practical skills in the field of Quality and Reliability Engineering. In this regard, they consist in applying acquired knowledge to meaningful problems for a specific topic.

For both the course and laboratory, the documents, as well as additional information, if necessary, will be uploaded to the Moodle platform in order to offer easy access to students and fast communication.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**

1	1. Introduction in quality and reliability 1.1. Terminology and context introduction 1.2. Presenting the concepts of reliability, quality, performance, and life cycle 1.3. The consequences of non-quality.	2
2	2. The philosophies regarding quality 2.1. Comparative presentation of Deming, Crosby, Juran and Taguchi's philosophies 2.2. Discussing the key points of their strategies 2.3. Examples from the service market.	2
3	3. Fundamentals of statistics applied in quality engineering 3.1. Introduction in descriptive statistics 3.2. Presenting the key elements of inferential statistics.	1
4	4. Introduction in reliability computation system and its indicators 4.1. Exposing the concept of quality and its computational system 4.2. Presenting the interconnections between reliability indicators (general and specific) for technical systems 4.3. Computational methods of reliability for series, parallel and mixed systems.	2
5	5. Quality management, methods, and tools 5.1. Tools for quality management 5.2. Quality function deployment, benchmarking, FMEDA etc. 5.3. Other tools for improving quality	2
6	6. Data analysis and sampling 6.1. Using histograms for data analysis 6.2. Understanding client's satisfaction level 6.3. Concepts of sampling	2
7	7. Control diagrams (Shewhart diagrams) and statistical processes 7.1. Control diagrams for variables 7.2. Control diagrams for attributes 7.3. Analyzing processes capabilities 7.4. Regression analysis 7.5. Logistic regression	2
8	8. Quality assurance and standardization 8.1. European standards ISO 8.2. Quality manual 8.3. The audit process	1
	Total:	14

Bibliography:

1. A. Mitra, Fundamentals of Quality Control and Improvement, Wiley, 2016.
2. K. C. Kapur, M. Pecht, Reliability Engineering, Wiley, 2014.
3. A. Mihalache, A. Bacivarof, I. Bacivarov, Fiabilitate and statistical control, IPB, 1989.
4. V. M. Cătuneanu, I. Bacivarof, Fiabilitatea sistemelor de telecomunicaţii. EMB, 1985.
5. V. M. Cătuneanu, A. Mihalache, Reliability Fundamentals. Elsevier, 1989.

LABORATORY

Crt. no.	Content	No. hours
1	General case studies of quality problems	2

2	Computation of reliability indicators	2
3	Reliability models	2
4	Quality function deployment	2
5	Quality management tools	2
6	Statistical control	2
7	Final laboratory exam	2
	Total:	14

Bibliography:

1. A. Mitra, Fundamentals of Quality Control and Improvement, Wiley, 2016.
2. K. C. Kapur, M. Pecht, Reliability Engineering, Wiley, 2014.
3. A. Mihalache, A. Bacivarof, I. Bacivarov, Fiabilitate and statistical control, IPB, 1989.
4. V. M. Cătuneanu, I. Bacivarof, Fiabilitatea sistemelor de telecomunicaţii. EMB, 1985.
5. V. M. Cătuneanu, A. Mihalache, Reliability Fundamentals. Elsevier, 1989.

11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course	The correctness of the obtained solutions	Tests during the semester	40%
	Application of theory to specific problems	Homework	20%
	Knowledge of fundamental theoretical notions	Final Paper (Written)	20%
11.5 Seminary/laboratory/project	Correct use of specific tools	Final laboratory discussion	20%
11.6 Passing conditions			
• Fulfilling the obligations characteristic of laboratory activity: teaching and supporting laboratory reports. • Obtaining 50% of the score related to the activity during the semester. To promote the discipline, the student must obtain at least 50% of the total score, in compliance with all the requirements specified in the POLITEHNICA Bucharest / ETTI Regulations.			

12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)

• Through the activities carried out, students develop skills to offer solutions to problems and to propose ideas to improve the existing situation in the field of reliability and quality of complex systems
• Knowledge / aspects / phenomena described by specialized literature / own research published / presented in journals and scientific conferences were taken into account in the development of the content of the discipline
• Through the practical activities in the "Quality and Reliability" laboratory, the development of the graduate's skills to manage practical situations that can be faced in real life is considered in order to increase his contribution to the improvement of the socio-economic environment.

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Date	Course lecturer	Instructor(s) for practical activities
23.09.2025	Conf. Dr. Iulian Nastac	Conf. Dr. Iulian Nastac

Date of department approval

Head of department

Conf. Dr. Ing. Bogdan Florea

Date of approval in the Faculty Council

Dean

Prof. Dr. Ing. Mihnea Udrea