SYLLABUS [1]

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty[2] / Department[3]	Mechanical Engineering / Materials and Manufacturing Engineering
1.3 Chair	–
1.4 Field of study (name/code[4])	Industrial Engineering /20.70.10 (HG185/2018 şi HG 158/2018)
1.5 Study cycle	Master
1.6 Study program (name/code/qualification)	Integrated Engineering; Efficient Welding Gas Protection Processes; Polymeric and Composite Products Engineering

2. Information about discipline

2.1 Name of discipline/The educational classe[5]			Advanced Mathematics for Engineers				
2.2 Coordinator (holder) of course activities			Assoc. Prof. Phd. eng. Aurel TULCAN				
2.3 Coordinator (holder) of applied activities[6]			Assoc. Prof. Phd. eng. Aurel TULCAN				
2.4 Year of study[7]	1	**2.5** Semester	2	**2.6** Type of evaluation	E	**2.7** Type of discipline[8]	DCAV

3. **Total estimated time** (direct activities (fully assisted), partially assisted activities and unassisted activities[9])

3.1 Number of hours fully assisted/week	4 ,of which:	**3.2** course	2	**3.3** seminar/laboratory/project			2
3.1* Total number of hours fully assisted/sem.	56 ,of which:	**3.2*** course	28	**3.3*** seminar/laboratory/project			28
3.4 Number of hours partially assisted/week	1,43 ,of which:	**3.5** project, research	1, 43	**3.6** training		**3.7** hours designing M.A. dizertation	
3.4* Number of hours pasrtially assisted/ semester	20 ,of which:	**3.5*** project of research	20	**3.6*** training		**3.7*** hours designing M.A. dizertation	
3.8 Number of hours of unassisted activities/ week	2,43 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					0,13
		Study using a manual, course materials, bibliography and lecture notes					1,5
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					0,8
3.8* Total number of hours of unasssited asctivities/ semester	34 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field					2
		Study using a manual, course materials, bibliography and lecture notes					21
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays					11
3.9 Total hrs./week[10]	7,86						
3.9* Total hrs./semester	110						
3.10 No. of credits	6						

4. **Prerequisites** (where applicable)

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[1] The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex 3), updated based on the Specific Standards ARACIS of December 2016.
[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 HG no. 376/18.05.2016 or in HG similars annually updated.
[5] The educational classes of disciplines (ARACIS – specific standards, art./paragraph 4.1.2.a) are: fundamental disciplines, field disciplines, majoring/specialization disciplines.
[6] The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] The year of study to which the discipline is provided in the curriculum .
[8] The types of disciplines (ARACIS – specific standards, art./paragraph 4.1.2.a) are: extended knowledge discipline / advanced knowledge discipline and synthetic discipline (DA / DCAV and DS) or art./paragraph 4.1.2 b) complementary discipline (DC)).
[9] Within UPT, the number of hours from 3.1*, 3.2*,…,3.9* are obtained by multipling by 14 (weeks) the number of hours from 3.1, 3.2,…, 3.9.
[10] The total number of hours/week is obtained by summing up the number of hours from 3.1, 3.4 şi 3.8.

4.1 Curriculum	• Preferably, a graduate of a bachelor's degree program in the field of study: Industrial Engineering or Mechanical Engineering
4.2 Competencies	• Engineering skills developed through specific disciplines of Industrial Engineering and Mechanical Engineering

5. Conditions (where applicable)

5.1 of the course	• Room 105, SPM, video projector, whiteboard and screen
5.2 to conduct practical activities	• Room 126, SPM, video projector, whiteboard and screen, computer network

6. Specific competencies acquired through this discipline

Specific competencies	• C1.1 Identification and detailed description of a wide range of concepts, principles, theorems and methods in basic engineering sciences (mathematics, physics, chemistry, drawing, etc.) • C1.3 Innovative application, integrated of the concepts from the areas of fundamental sciences, for solving problems incompletely determined from the design and operation of technical systems, specific to the field of Industrial Engineering • C2.5 Ability to prepare relevant analysis reports, quantitative and qualitative assessments on situations specific to the design and manufacture of products • C 5.1 Knowledge and description of concepts, principles and tools for quality assurance in manufacturing processes • C5.2 Ability to analyze, explain and interpret with a high degree of detail the aspects related to product quality control, operator training and presentation of research results • C6.1 Knowledge and competent use of investigation methods, techniques and research methods in the field of Industrial Engineering • C6.2 Integrated use of expertise to correctly identify a technical problem, cause and influence • C6.4 Use relevant knowledge to explain, interpret, and present the results of experimental research to formulate constructive hypotheses and conclusions
Professional competencies ascribed to the specific competencies	• C1. Solving complex tasks, specific to Industrial Engineering, using advanced knowledge of engineering sciences • C2. Relevant use of knowledge about materials and technologies to explain and interpret theoretical and practical problems specific to Industrial Engineering and processing of polymeric and composite materials • C5. Conception, implementation and coordination of the quality management system for manufacturing processes of plastic and composite products • C6. Development and management of professional and / or research projects using acquired engineering knowledge and skills
Transversal competencies ascribed to the specific competencies	• CT1. Applying the values and ethics of the engineering profession and responsible execution of complex professional tasks in conditions of professional autonomy and independence; promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making. • CT2. Carrying out activities with the exercise of specific roles of teamwork on different hierarchical levels and with the assumption of leadership roles; promoting the spirit of initiative, dialogue, cooperation, positive attitude and respect for others, diversity and multiculturalism and the continuous improvement of one's activity.

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

7.1 The general objective of the discipline	• Acquiring of skills and abilities for the innovative solution of problems regarding the design and manufacture of products, respectively quality management and control of manufacturing processes • Acquiring of skills for the implementation of applications of modeling, simulation, analysis and optimization of materials, products and manufacturing processes
7.2 Specific objectives	• Application of optimization, simulation and modeling methods in the analysis of technological manufacturing processes and in the rapid development of products • Integrated use of expertise to correctly identify a technical problem, causes and influencing factors • Ability to prepare relevant analysis reports, quantitative and qualitative assessments on specific situations of product design and manufacture

8. Content

8.1 Course	Number of hours	Teaching methods

1. Basic Statistics Definition; Type of Data; Data collection Methods; Central tendency- dispersion measurement; Distributions; Errors; Hypotheses Testing; Analysis of Variance (ANOVA); Relations Between Variables (Correlation, Regression); Quality Control Tools: Pareto Chart, Cause-and-Effect Diagrams, Histograms, Scatter Diagrams.	8	Lecture, Presentation, Blackboard demonstration, Questioning, Illustration, Case Study, Deductive logic, Interactive debate, Use of dedicated software
2. Design of Experiments (DoE) Terminology; Planning and Organizing Experiments; The 2^k Factorial Design; The 2^{k-p} Fractional Design; Randomized Blocks Design; Response Surface Methods and Design; Case studies.	6	
3. Evaluation of manufacturing processes Process control system; Causes; Local actions and System actions; Basic concepts in process evaluation.	2	
4. Statistical Process Control (SPC) Control charts for variable data: Xbar and R control charts; Xbar and S control charts. Control charts for attributes data: "p", "np", "c" and "u" control charts.	5	
5 Capability analysis General considerations; Process capability; Capability indices; Capability for non-normal distributions; Capability for attributive characteristics; Critical aspects regarding the use of Cp and Cpk	3	
6 Measurement System Analysis Terms and definitions: Measurement System error; Accuracy; Precision; Gage Repeatability and Reproducibility: Variance Components; The Tabular Method (Range Method); The Analysis of Variance Method	4	

Bibliography[11]

1. Aurel Tulcan – Matematici avansate pentru ingineri, Campus Virtual, UPT
2. Connie M, Borror, Editor, The Certified Quality Engineer Handbook, Third Edition, ASQ Quality Press Milwaukee, Wisconsin, USA, 2009
3. Chris Rauwendaal, SPC – Statistical Process Control in Injection Molding and Extrusion, Hanser Gardner Publications, USA, 2000
4. Douglas C. Montgomery, Design and Analysis of Experiments, 6th Edition, John Wiley & sons Inc., New York, USA, 2005
5. Statgraphics Centurion XVI-User Manual, 2010 by StatPoint Technologies, Inc., www.STATGRAPHICS.com
6. ***, Statgraphics – Reference manual, User Manual, Quickstart guide, Manugistics Inc. 1992
7. Getting Started with Minitab 17, http://www.minitab.com/uploadedFiles/Documents/getting-started/Minitab17_GettingStarted-en.pdf

8.2 Applied activities[12]	Number of hours	Teaching methods
Basic statistics applications	6	Blackboard demonstration, Questioning, Illustration, Case Study,
Design of experiments by using Statgraphics and Minitab. Case studies.	6	
Evaluation of manufacturing process	2	
Statistical process control: Xbar-R control charts. Case studies.	6	

[11] At least one title must belong to the department staff teaching the discipline, and at least one title must refer to a relevant work for the discipline, a national and international work that can be found in the UPT Library.

[12] The types of applied activities are those mentioned in 5. If the discipline containes more types of applied activities then they are marked, consecutively, in the table below. The type of activity will be marked distinctively under the form: „Seminar:", „Laboratory:", „Project:" and/or „Practice/Training:".

		Deductive logic, Interactive debate, Use of dedicated software
Capability analysis. Case studies.	4	
Measurement system analysis.	4	

Bibliography[13]

1. Aurel Tulcan – Matematici avansate pentru ingineri, Campus Virtual, UPT
2. Connie M, Borror, Editor, The Certified Quality Engineer Handbook, Third Edition, ASQ Quality Press Milwaukee, Wisconsin, USA, 2009
3. Chris Rauwendaal, SPC – Statistical Process Control in Injection Molding and Extrusion, Hanser Gardner Publications, USA, 2000
4. Douglas C. Montgomery, Design and Analysis of Experiments, 6th Edition, John Wiley & sons Inc., New York, USA, 2005
5. Statgraphics Centurion XVI-User Manual, 2010 by StatPoint Technologies, Inc., www.STATGRAPHICS.com
6. ***, Statgraphics – Reference manual, User Manual, Quickstart guide, Manugistics Inc. 1992
7. Getting Started with Minitab 17, http://www.minitab.com/uploadedFiles/Documents/getting-started/Minitab17_GettingStarted-en.pdf

9. Coroboration 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

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10. Evaluation

Type of activity	**10.1** Evaluation criteria[14]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Grade 5 is given for 50% knowledge of each subject, and grade 10 for 100% knowledge of each subject	Summative evaluation through a written paper, which consists of a theoretical topic, a synthesis topic and an applied topic	60%
10.5 Applied activities	**S:**		
	L: Grade 5 is given for the answer to 50% of the questions and grade 10 for the answer to all the questions	Topic questions asked during the laboratory sessions. Assessment of practical skills.	40%
	P:		
	Pr:		
	Tc-R[15]:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified[16]			
• The minimum amount of knowledge to pass the discipline is 50% of the total volume of knowledge taught. • The student has to use the correct expression of defined notions and concepts and to solve and explain topics of medium complexity.			

Date of completion | **Course coordinator (signature)** | **Coordinator of applied activities (signature)**

Head of Department | **Date of approval in the Faculty** | **Dean**

[13] At least one title must belong to the staff teaching the discipline.
[14] The Syllabus must contain the evaluation method of the discipline, specifying the criteria, the metods and the forms of evaluation, as well as mentioning the share attached to these within the final mark. The evaluation criteria must correspond to all activities stipulated in the curriculum (course, seminar, laboratory, project), as well as to the methods of continuous assessment (homework, essays etc.)
[15] Tc-R= Homework-Reports
[16] For this point turn to "Ghid de completare a Fișei disciplinei" found at: http://univagora.ro/m/filer_public/2012/10/21/ghid_de_completare_fisa_disciplinei.pdf

(signature) **Council [17]** **(signature)**

[17] The approval is preceeded by discussing the study program's board's point of view with redgards to the syllabus.