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 /20.70.130.10
1.5 Study cycle	Bachelor
1.6 Study program (name/code/qualification)	Manufacturing Engineering

2. Information about the discipline

2.1 Name of discipline/ formative category[5]	3D Measurement Procedures						
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]	4	**2.5** Semester	6	**2.6** Type of evaluation	E	**2.7** Type of discipline[8]	DO

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [9]

3.1 Number of fully assisted hours / week	3 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	1
3.1* Total number of fully assisted hours / semester	42 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	14
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	3,71 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0,71
		hours of individual study after manual, course support, bibliography and notes			2
		training seminars / laboratories, homework and papers, portfolios and essays			1
3.7* Number of hours of unassisted activities / semester	52 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			10
		hours of individual study after manual, course support, bibliography and notes			28
		training seminars / laboratories, homework and papers, portfolios and essays			14
3.8 Total hours / week [10]	6,71				
3.8* Total hours /semester	94				
3.9 Number of credits	4				

4. **Prerequisites** (where applicable)

4.1 Curriculum	•

[1] The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.
[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] The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.
[5] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[6] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] Year of studies in which the discipline is provided in the curriculum.
[8] Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).
[9] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[10] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.2 Competencies	• Engineering skills developed through specific disciplines of industrial engineering and mechanical engineering field • Basic knowledge in tolerances and drawings

5. Conditions (where applicable)

5.1 of the course	• Room 126, SPM, video projector, whiteboard and screen
5.2 to conduct practical activities	• Laboratory of 3D Measuring •

6. Specific competencies acquired through this discipline

Specific competencies	• Elaboration of technological manufacturing processes • Design and operation of manufacturing equipment
Professional competencies ascribed to the specific competencies	• Applying the values and ethics of the engineering profession, and responsible execution of professional tasks in conditions of limited autonomy and qualified assistance. Promoting logical, convergent and divergent reasoning, practical applicability, evaluation and self-evaluation in decision making.
Transversal competencies ascribed to the specific competencies	•

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Through the acquired knowledge, it is desired that the future engineer, graduate of the Manufacturing Engineering study program, will be able to understand and solve the problems specific to the chosen specialization and to understand the measuring procedures using Coordinate Measuring Machines. •
7.2 Specific objectives	• To give knowledge to students about the main architectures of Coordinate Measuring Machines and how to choose them according to the specifications of the measuring parts • Understanding 3D measurement procedures for measuring parts with regular shapes, as well as those with complex shapes •

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. Coordinate Measuring Machines: definition, classification, architecture and utilization.	2	Lecture, Presentation,

[11] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[12] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

2. Main components of the Coordinate Measuring Machines: mechanical frame, guide system, air bearings, drive system, probe system, measuring software	4	Whireboard demonstration, Questioning, Illustration, Case Study, Deductive logic, Interactive debate, Use of dedicated software
3. Tactile and optical sensors	3	
4. Probe qualification	1	
5. Measuring Elements	2	
6. Part alignment. Coordinate systems.	3	
7. Geometrical product specification according ISO 1101 and ISO 5459	3	
8. 3D measuring procedures for different types of parts	3	

Bibliography [13]

1. Aurel Tulcan – Proceduri de măsurare 3D (3D Measurement Procedures), E-book, Virtual Campus-UPT
2. Aurel Tulcan, Liliana Tulcan, Tudor Iclănzan – Sisteme de control, Editura Politehnica, Timișoara, 2006
3. Robert J. Hocken, Paulo H. Pereira, Coordinate Measuring Machines and Systems, Second Edition, CRP Press, Taylor&Francis Group, 2012
4. Hexagon Manufacturing Intelligence, PC-DMIS CMM Manual For Version 2019 R2
5. ***, Mouvement Française pour la qualité, Machines à mesurer tridimensionelle, Paris, 1998
6. ***, Quindos 7 - Tutorial: Messtechnick Wetzlar, Germania, 2019

8.2 Applied activities [14]	Number of hours	Teaching methods
1. TESA MicroMs 343 and DEA Global Advantage 7.10.7 Coordinate Measuring Machines description	2	Problem exposure, Whiteboard demonstration, Questioning, Case Study, Deductive logic, Interactive debate, Teamwork, Practical work, Conversation, Use of dedicated software
2. Measuring software: Quindos 7 and PC-DMIS 2019 R2	2	
3. Probe qualification	2	
4. Part alignment. Case studies	2	
5. Measuring a part with plane and spatial features	4	
6. Measuring report and interpretation. t	2	

Bibliography [15]

1. Aurel Tulcan – Proceduri de măsurare 3D (3D Measurement Procedures), E-book, Virtual Campus-UPT
2. Aurel Tulcan, Liliana Tulcan, Tudor Iclănzan – Sisteme de control, Editura Politehnica, Timișoara, 2006
3. Robert J. Hocken, Paulo H. Pereira, Coordinate Measuring Machines and Systems, Second Edition, CRP Press, Taylor&Francis Group, 2012
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5. ***, Mouvement Française pour la qualité, Machines à mesurer tridimensionelle, Paris, 1998
6. ***, Quindos 7 - Tutorial: Messtechnick Wetzlar, Germania, 2019

[13] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[14] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[15] At least one title must belong to the discipline team.

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

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10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**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[17]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [18])			
• 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 (signature)	**Date of approval in the Faculty Council [19]**	**Dean (signature)**
……		……

[16] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

[17] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

[18] It will not explain how the promotion mark is awarded.

[19] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.