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]	Management in Production and Transportation / Management
1.3 Chair	—
1.4 Field of study (name/code[4])	Engineering and Management / 20.70.230.30
1.5 Study cycle	Bachelor
1.6 Study program (name/code/qualification)	Industrial Economic Engineering / 60

2. Information about the discipline

2.1 Name of discipline/ formative category[5]			Manufacturing and Control Machinery				
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]	3	**2.5** Semester	6	**2.6** Type of evaluation	D	**2.7** Type of discipline[8]	DI

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	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	28
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	4,28 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0,57
		hours of individual study after manual, course support, bibliography and notes			2,29
		training seminars / laboratories, homework and papers, portfolios and essays			1,42
3.7* Number of hours of unassisted activities / semester	60 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			8
		hours of individual study after manual, course support, bibliography and notes			32
		training seminars / laboratories, homework and papers, portfolios and essays			20
3.8 Total hours / week [10]	8,285				
3.8* Total hours /semester	116				
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 drawings

5. Conditions (where applicable)

5.1 of the course	• Room 173, Faculty of Mechanical Engineering, video projector, whiteboard and screen
5.2 to conduct practical activities	• Laboratories of Plastic Deformation Technologies, Plastic injections and 3D Measuring •

6. Specific competencies acquired through this discipline

Specific competencies	•
Professional competencies ascribed to the specific competencies	• C3. Use of software applications and information technologies to solve specific engineering and management tasks. • C4. Economic evaluation, planning and management of logistics and production processes and systems. • C6. Technical-economic design and improvement of industrial products and processes
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 Industrial Economic Engineering study program, will be able to understand and solve the problems specific to the chosen specialization •
7.2 Specific objectives	• To give knowledge to students regarding the manufacturing and control machinery in order to plan and manage the processes and the logistic and production systems, respectively for the improvement of the industrial products and processes. •

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
A. SHEET METAL FORMING, PROCESSES AND APPLICATIONS **1. Sheet metal forming characterization**	10	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.).

Introduction; Classification of sheet metal forming; Materials used in metal forming; State of stress-strain in deformation processes **2. Punching and Blanking** Punching and blanking process; Stress and strain; Part edge characteristics; Punch and Die dimensioning; Part nesting; Forces; Blanking dies; Classification; Dies components; Progressive die **3. Bending** Bending process; Stress-strain distribution in bending; Flat pattern dimensioning; Bending parts quality: minimum bend radius, Springback: methods of reducing or eliminating springback; Forces; Bending dies. **4. Deep drawing** Deep drawing process; Stress-strain distribution in deep drawing; Quality of deep drawing parts; Deep drawing blank dimensioning; Draw ratio; Forces; Deep drawing tooling		Whiteboard demonstration, Questioning, Illustration, Case Study, Deductive logic, Interactive debate
5. Sheet metal forming machines Evolution of forming machines; Classification; Auxiliary machines (Shear presses; Flat straightening machine) Straight side crank press: Classification; General characteristics of mechanical presses; Eccentric Press; Straight side crank press. Specialized machines (press brake, roll forming machine, rolling machine) Special machines (Bihler presses, thread rolling machines, spring coiling machines) CNC machines: Blanking press (Amada turret press, Trumpf punch press) Press brake; Roll forming machines	6	
B. INJECTION MOLDING TECHNOLOGY 1. **Plastics materials**: General considerations; Plastics and plastics properties; Thermosets and thermoplastics; Classification of plastic technologies: molding, extrusion, calendering, termoforming, laminates and composites molding, assembling 2. **Thermoplastic injection molding process**: Characteristics of the injection molding process; Molding process classification; The mold 3. **Injection molding machine**: Molding machine classification; Plasticating unit.	6	

C. COORDINATE MEASURING MACHINES (CMMs) 1. **3D metrology** 2. **CMMs architecture**: Moving bridge architecture; Fixed bridge and moving table architecture 3. **CMM elements**: Mechanical structure; Air bearings; Linear encoders; Probing systems 4. **CMM installation and environmental control** 5. **The structure of a measuring program**	6	

Bibliography [13]

1. Aurel Tulcan – Utilaje de prelucrare și control (Manufacturing and Control Machinery), E-book, Virtual Campus-UPT

2. Aurel Tulcan - Sisteme flexibile de fabricaţie prin presare la rece, Editura Politehnica, Timişoara, 2002

2. Taylan Altan, Eermen Tekkaya - Sheet Metal Forming, Processes and Applications, ASM International, 2012

3. Ivana Suchy – Handbook of Die Design, Second Edition, McGraw-Hill Publishing House, 2006

4. J.S. Colton, Sheet Metal Forming, Georgia Institute of Technology, 2009

5. Tudor Iclănzan - Tehnologia prelucrării materialelor plastice şi compozite, Ed. Politehnica, Timişoara, 2006

6. Y. Chinniah, S. Jocelyn, B. Aucourt, R. Bourbonniere - Plastic Injection Moulding Machines with Auxiliary Equipment, 2017

7. Aurel Tulcan, Liliana Tulcan, Tudor Iclănzan – Sisteme de control, Editura Politehnica, Timișoara, 2006

8. Hexagon Manufacturing Intelligence, PC-DMIS CMM Manual For Version 2019 R2

8.2 Applied activities [14]	Number of hours	Teaching methods
Dies: classification and components	4	Problem exposure, Whiteboard demonstration, Questioning, Case Study, Deductive logic, Interactive debate, Teamwork, Practical work, Conversation, Use of dedicated software
Mechanical presses: construction and set up	4	
Kinematic analysis of the eccentric mechanism of the mechanical press PE63	2	
Quality of the punching and blanking parts	2	
Automatic cold forming line operation	4	
Plastic Materials identification	2	
Plastic Injection Molding Machines and Molds	4	
Coordinate Measuring Machines	2	
Measurement procedures on DEA Global Advantage 7.10.7 CMM with PC-DMIS software	4	

[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".

Bibliography [15]

1. Aurel Tulcan – Utilaje de prelucrare și control (Manufacturing and Control Machinery)-aplicații, E-book, Virtual Campus-UPT
2. Aurel Tulcan – Tehnologii de deformare plastică - aplicații specifice; Editura Politehnica, Timișoara, 2019
3. Aurel Tulcan - Sisteme flexibile de fabricaţie prin presare la rece, Editura Politehnica, Timişoara, 2002
3. Taylan Altan,Eermen Tekkaya - Sheet Metal Forming, Processes and Applications, ASM International, 2012
4. Ivana Suchy – Handbook of Die Design, Second Edition, McGraw-Hill Publishing House, 2006
5. J.S. Colton, Sheet Metal Forming, Georgia Institute of Technology, 2009
6. Tudor Iclănzan - Tehnologia prelucrării materialelor plastice şi compozite, Ed. Politehnica, Timişoara, 2006
7. Y. Chinniah, S. Jocelyn, B. Aucourt, R. Bourbonniere - Plastic Injection Moulding Machines with Auxiliary Equipment, 2017
8. Aurel Tulcan, Liliana Tulcan, Tudor Iclănzan – Sisteme de control, Editura Politehnica, Timișoara, 2006
9. Hexagon Manufacturing Intelligence, PC-DMIS CMM Manual For Version 2019 R2

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

-

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)**
……		……

[15] At least one title must belong to the discipline team.
[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.