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 / Welding Engineering

2. Information about the discipline

2.1 Name of discipline/ formative category[5]			Plastic Deformation Technologies				
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	5	**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	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	3,71 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			1,5
		training seminars / laboratories, homework and papers, portfolios and essays			1,21
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			14
		hours of individual study after manual, course support, bibliography and notes			21
		training seminars / laboratories, homework and papers, portfolios and essays			17
3.8 Total hours / week [10]	7,71				
3.8* Total hours /semester	108				
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 123, Faculty of Mechanical Engineering, video projector, whiteboard and screen
5.2 to conduct practical activities	• Room 126, SPM, video projector, whiteboard and screen • Laboratory of Plastic Deformations Technologies •

6. Specific competencies acquired through this discipline

Specific competencies	•
Professional competencies ascribed to the specific competencies	• Performing calculations, demonstrations and applications to solve tasks specific to industrial engineering based on knowledge from basic sciences • Associating knowledge, principles and methods in the technical sciences of the field with graphical representations for solving specific tasks • Elaboration of manufacturing processes • Design and operation of manufacturing equipment
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, a graduate of the Manufacturing Engineering or Welding Engineering study program, to understand and solve the problems specific to the chosen specialization regarding deformation technologies, respectively the conception and design of related tools. •
7.2 Specific objectives	• To give to students knowledge on the technologies of processing by plastic deformation of the sheet metal parts. • To give to students knowledge regarding the design of dies. •

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. Sheet metal forming characterization	4	Lecture,

[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		Presentation, Whireboard demonstration, Questioning, Illustration, Case Study, Deductive logic, Interactive debate, Use of dedicated software
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	8	
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	
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	6	
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	

Bibliography [13]

1. Aurel Tulcan – Tehnologii de deformare plastică (Plastic Deformation Technologies), E-book, Virtual Campus-UPT
2. 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
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

[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.

8.2 Applied activities [14]	Number of hours	Teaching methods
Laboratory:		Problem exposure, Whiteboard demonstration, Questioning, Case Study, Deductive logic, Interactive debate, Teamwork, Practical work, Conversation
1. Classification, components and operation of dies	4	
2. Eccentric mechanical presses: construction and set up	2	
3. The influence of the die clearance to the quality of punching and blanking parts	2	
4. Determination of bending forces. Calculation of the flat pattern of a bending part.	2	
5. Stress and strain of the sheet metal during the deep-drawing deformation process of the cylindrical parts	4	
Project:		
Die design for manufacturing a sheet metal part.	14	Problem exposure, Whiteboard demonstration, Case Study, Deductive logic, Interactive debate, Teamwork, Conversation, Use specific CAD software

Bibliography [15]

1. Aurel Tulcan – Tehnologii de deformare plastică (Plastic deformation technologies), E-book, Virtual Campus-UPT
2. Aurel Tulcan – Tehnologii de deformare plastică - aplicații specifice; Editura Politehnica, Timișoara, 2019
3. Aurel Tulcan – Tehnologii de deformare plastică – proiectare, E-book, Campus Virtual, UPT
4. Şt. Rosinger - Procese şi scule de presare la rece, Editura Facla, Timişoara, 1987
5. Şt. Rosinger, A. Tulcan, F. Ferician, ş.a., Tehnologia presării la rece-îndrumător, Litografia UTT, Timişoara, 1994
6. Taylan Altan,Eermen Tekkaya - Sheet Metal Forming, Processes and Applications, ASM International, 2012
7. Ivana Suchy – Handbook of Die Design, Second Edition, McGraw-Hill Publishing House, 2006

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	Topic questions asked during the laboratory sessions. Assessment of practical skills.	40%

[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.
[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.)

	questions		
	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)**
……		……

[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.