

## SYLLABUS

### 1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Automotive Engineering, Mechatronics and Mechanics
1.3	Department	Automotive Engineering and Transportation
1.4	Field of study	Automotive Engineering
1.5	Cycle of study	Master in Science
1.6	Program of study/Qualification	Tehnici Avansate în Ingineria Autovehiculelor (Advanced Techniques in Automotive Engineering) - în limba engleză
1.7	Form of education	Full time
1.8	Subject code	05.20

### 2. Data about the subject

2.1	Subject name	CAM engineering in manufacturing				
2.2	Subject area	Automotive Engineering				
2.2	Course responsible/lecturer	Assoc. Prof. PhD. Eng. Paul Bere				
2.3	Teachers in charge of seminars	Assoc. Prof. PhD. Eng. Paul Bere				
2.4	Year of study	I	2.5 Semester	I	2.6 Assessment	C
2.7	Subject category	Formative category			DS	
		Optionality			DO	

### 3. Estimated total time

3.1	Number of hours per week	2	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laborator	0	3.3 Proiect	1
3.4	Total hours in the curriculum	28	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laborator	0	3.6 Proiect	14
3.7 Individual study:											
(a) Manual, lecture material and notes, bibliography											20
(b) Supplementary study in the library, online and in the field											20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays											3
(d) Tutoring											2
(e) Exams and tests											2
(f) Other activities											-
3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))											47
3.9 Total hours per semester (3.4+3.8)											75
3.10 Number of credit points											3

### 4. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge of mathematics, physics, mechanics, manufacturing basics, materials science computing engineering
4.2	Competence	Computer use knowledge

## 5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications seminarului / laboratorului / proiectului	

## 6. Specific competences

Professional competences	<p>Identify, define and use specific technologies for making parts from different materials.</p> <p>Description of the theories and basic principles for designing the manufacture of specific vehicle parts through CAM</p> <p>Use the basic knowledge to explain and interpret the different technologies used in the manufacture of automotive components.</p> <p>Application of basic methods and principles for designing manufacturing processes using classic machining or CNC machining centers.</p> <p>Advantages and limitations of classical or modern machining machines and flexible systems for standard quality assessment in manufacturing processes. Development of new materials and technologies in the field of automotive components</p> <p>Studying and developing technical solutions in the field of manufacturing and production of automotive components</p>
Cross competences	<p>Responsibility for complex professional duties, under conditions of limited autonomy and qualified assistance - Autonomy and responsibility</p> <p>Awareness of the need for continuous training; efficient use of resources and learning techniques for personal and professional development - personal and professional development</p> <p>Effective use of language skills and knowledge of information and communication technology.</p>

## 7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing professional skills in the field of automotive technology
7.2	Specific objectives	<p>Knowledge, understanding of the concepts, theories and methods of the manufacturing process; Their correct use in professional communication;</p> <p>Using basic knowledge for applying and interpreting different types of methods, situations, processes, etc. (in wider contexts) associated with vehicle components - Explanation and interpretation;</p> <p>Developing professional projects using innovative, quantitative and qualitative principles and methods in the automotive industry</p>

## 8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. Introduction. General about manufacturing technologies in car development	2	Exposure (explanation, description), presentation, analysis, advantages, disadvantages, applicability, conversation, demonstration, illustration, guidance etc.	ONLINE using MS TEAMS
2. Fast prototyping technologies using CAM.	2		
3. Cutting machining technologies CAM.	2		
4. Processes and production equipment. Production of castings by casting.	2		
5. Technologies for the manufacture of plastic parts. Mold injection, extrusion, thermoforming, calendering, plastics according to CAM.	2		
6. Technologies for obtaining composite materials. Vacuum contacting via RTM through simultaneous projection, autoclave, VRTM, by pressing.	2		
7. Surface coating technology. Surface treatments. Eco-design in the automotive industry.	2		
<b>Bibliography</b> <ol style="list-style-type: none"> <li>Ancau M., Manufacturing Technologies, Editura Casa Cartii de Stiinta , Cluj-Napoca, 2003</li> <li>DeGarmo E.P.s.a, Materials and Processes in Manufacturing, Prentice Hall, New York, 8<sup>th</sup> edition, 1997,</li> <li>Kalpacjian S., Manufacturing Processes for Engineering Materials, Adison Vesley Longman Inc. 3<sup>rd</sup> edition, 1997,</li> <li>Berce,P. Tehnologia fabricației și a reparației utilajului tehnologic. Cluj-Napoca 1991</li> <li>Berce, P., Bâlc, N., ș.a. Tehnologii de Fabricare Rapidă a Prototipurilor, Editura Tehnică, București, 2000,</li> <li>Bâlc, N. Tehnologia Neconvenționale, Cluj-Napoca, Editura Dacia, 2001,</li> <li>Marinescu, N.I., ș.a. Prelucrări neconvenționale in construcția de mașini, Editura Tehnică, București, 1993</li> <li>Bâlc, N., Gyenge, Cs., Berce, P., Proiectare pentru Fabricația Competitivă, Cluj-Napoca, Editura Alma Mater, 2006,</li> <li>Gyenge,Cs., Fratila,D. Ingineria fabricatiei. Editura Alma Mater, Cluj-Napoca .2004. ISBN 973-8397-77-4</li> <li>Bere P., Materiale compozite polimerice, Editura UTPRESS 2012</li> <li>Hancu,L., Iancau,H., Tehnologia materialelor nemetalice. Tehnologia fabricării pieselor din materiale plastice, Editura ALMA MATER, 2003, 304 pagini, ISBN 973-8397-34-0..</li> <li>Iancău,H., Nemeș, O., Materiale compozite- concepție și fabricație, 2002, 155 pagini, editura MEDIAMIRA-Cluj Napoca.</li> <li>Seres I., Injectarea materialelor plastice . Editura Imprimeriei de Vest.</li> </ol>			
8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
1. Introduction.	2	Presenting the equipment, Manufacture	ONLINE using MS TEAMS,
2. Analysis of machining operations by means of lathe and universal milling machine (CAM to CNC).	2		

3. Mechanical machining on different types of machine tools (CAM to CNC).	2	samples and discus illustration. Studies the best practices, automotive application, examples Results, method guidance etc.	Work using MATLAB, installed using University licensing.
4. Analysis of the different manufacturing methods applied to the parts. Case Study	2		
5. Presentation of Rapid Prototyping Technologies. SLS. FDM, LOM, SLM.	2		
6. Thermoforming of plastics.	2		
7. Contact formation of composite materials.	2		

#### Bibliography

1. Ancau M., Manufacturing Technologies, Editura Casa Cartii de Stiinta , Cluj-Napoca, 2003
2. DeGarmo E.P.s.a, Materials and Processes in Manufacturing, Prentice Hall, New York, 8<sup>th</sup> edition, 1997,
3. Kalpacjian S., Manufacturing Processes for Engineering Materials, Adison Vesley Longman Inc. 3<sup>rd</sup> edition, 1997,
4. Berce,P. Tehnologia fabricației și a reparației utilajului tehnologic. Cluj-Napoca 1991
5. Berce, P., Bâlc, N., ș.a. Tehnologii de Fabricare Rapidă a Prototipurilor, Editura Tehnică, București, 2000,
6. Bâlc, N. Tehnologia Neconvenționale, Cluj-Napoca, Editura Dacia, 2001,
7. Marinescu, N.I., ș.a. Prelucrări neconvenționale in construcția de mașini, Editura Tehnică, București, 1993
8. Bâlc, N., Gyenge, Cs., Berce, P., Proiectare pentru Fabricația Competitivă, Cluj-Napoca, Editura Alma Mater, 2006,
9. Gyenge,Cs., Fratila,D. Ingineria fabricatiei. Editura Alma Mater, Cluj-Napoca .2004. ISBN 973-8397-77-4
10. Bere P., Materiale compozite polimerice, Editura UTPRESS 2012
11. Hancu,L., Iancau,H., Tehnologia materialelor nemetalice. Tehnologia fabricării pieselor din materiale plastice, Editura ALMA MATER, 2003, 304 pagini, ISBN 973-8397-34-0..
12. Iancău,H., Nemeș, O., Materiale compozite- concepție și fabricație, 2002, 155 pagini, editura MEDIAMIRA-Cluj Napoca.
13. Seres I., Injectarea materialelor plastice . Editura Imprimeriei de Vest.

#### 9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The skills acquired will be required for employees working in the field of motor vehicle engineering. Competence training takes into account employers' recommended options for higher education institutions for graduate training (ability to use time effectively, teamwork responsibility, ability to learn quickly, ability to coordinate teams, new opportunities in the field of interest the ability to use computer simulation, the ability to adapt to new situations, etc.) as well as the priorities recommended by employers in the field to prepare graduates (creativity and ability to innovate, ability to negotiate, critical and self- criticizes analytical ability, knowledge of other areas).

## 10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Frequency and behaviour in activities. The given marks to the final examination	written assessment (MS TEAMS)	80%
10.5 Seminars /Laboratory/Project	- Ability to work with assimilated knowledge; - Ability to apply in practice;	Active participation at applications.	20%
10.6 Minimum standard of performance			
Laboratory work and project – minimum grade 5(five)			
Each subject must be solved, minimum grade 5(five)			

Date of filling in:		Title Surname Name	Signature
23.09.2021	Lecture	Assoc. Prof. PhD. Eng. Paul Bere	
	Teachers in charge of application	Assoc. Prof. PhD. Eng. Paul Bere	

Date of approval in the department .....	Head of department Prof.PhD.Eng. Barabás István
_____	
Date of approval in the faculty .....	Dean Prof.PhD.Eng. Filip Nicolae
_____	