SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Automotive Engineering, Mechatronics and Mechanics
1.3	Department	Automotive Engineering and Transports
1.4	Field of study	Automotive Engineering
1.5	Cycle of study	Master of Science
1.6	Program of study/Qualification	Advanced Techniques in Automotive Engineering - English
1.7	Form of education	Full time
1.8	Subject code	3.00

2. Data about the subject

2.1	Subject name				Auxiliary Internal Combustion Engine Components		
2.2	Subject area				Automotive Engineering		
2.2	Course responsible/lecturer				Assoc. Prof. PhD Eng. Nicolae Vlad BURNETE		
2.3	Teachers in charge of seminars				Assoc. Prof. PhD Eng. Nicolae Vlad BURNETE – nicolae.vlad.burnete@auto.utcluj.ro Eng. Dorin Marius Stefan CAPATA - capata.fi.dorin@student.utcluj.ro		
2.4 Year of study	1	2.5 Semester	1	2.6 Assessment	E		
2.7 Subject category	Formative category						DA
	Optionality						DI

3. Estimated total time

3.1 Number of hours per week	3	of which	3.2 Course	1	3.3 Seminar	0	3.3 Laboratory	1	3.3 Project	1
3.4 Total hours in the curriculum	42	of which	3.5 Course	14	3.6 Seminar	0	3.6 Laboratory	14	3.6 Project	14

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	18
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	28
(d) Tutoring	14
(e) Exams and tests	3
(f) Other activities	0

3.8 Total hours of individual study (sum (3.7(a)…3.7(f)))	83
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge about internal combustion engines.
4.2	Competence	Computer skills.

5. Requirements (where appropriate)

5.1	For the course	Classroom with blackboard and projector.

5.2	For the applications seminar / laboratory / project	The attendance (100% presence) and the completion of the activities from the applications condition the admission to the final assessment.

6. Specific competences

Professional competences	- Apply specific technical knowledge to describe and analyze the operation of internal combustion engine (i.c.e.) systems with respect to the design, build and use of road vehicles; - Use adequate criteria and standard methods to evaluate internal combustion engines; - Knowledge of parts, systems, installations and equipment currently in use in internal combustion engines; - Ability to describe, explain and demonstrate their operation; - Identify the components of auxiliary systems of an i.c.e.; - Ability to perform case studies and simulation in order to identify the influences that different components have on the operation, performances and pollutant emissions of the i.c.e.; - Develop competencies in a multi- and interdisciplinary environment; - Develop a preliminary research report.
Cross competences	- Respect for the principles, norms and values of the professional conduct code by adopting a rigorous, efficient and responsible work strategy to solve problems and make decisions; - Apply appropriate techniques to ensure good relations and effective team work in a multidisciplinary team, across hierarchies, - Written and oral communication abilities in english and romanian; - Communication (oral and written) in English and Romanian; - Research, analysis and decision-making abilities; - Respect for professional work ethics.

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

7.1	General objective	Develop specific competencies in the field of internal combustion engine auxiliary systems for professional growth.
7.2	Specific objectives	1. Assimilating theoretical knowledge about auxiliary engine systems used in modern i.c.e.; 2. Understanding the role of auxiliary engine components and their integration in these systems; 3. Create a virtual model of the physical system to simulate its operation to highlight, understand and interpret its effects on the i.c.e.

8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1. ICEs. Basics and future development	2	Presentations, discussions	
2. Alternative fuels supply systems	2		
3. Aftertreatment systems for SIEs	2		
4. Aftertreatment systems for CIEs	2		
5. Charging systems	2		
6. Variable valve actuation	2		
7. Other ICE systems	2		

Bibliography
1. Robert Bosch GmbH, Bosch Automotive Handbook, Wiley, 2018
2. Van Basshuysen, R., Schaefer, F., Internal Combustion Engine Handbook, 2nd English Edition, SAE International, 2016
3. Mollenhauer, K., Tschöke, H., Handbook of Diesel Engines, Springer, 2010

8.2. Laboratory	Number of hours	Teaching methods	Notes
1. Presentation of the laboratories. Work safety notions	2	Presentations, applications	
2. Analysis of the EGR system	2		
3. Analysis of charging systems	2		
4. Analysis of the SCR system	2		
5. Analysis of DPFs	2		
6. Analysis of START-STOP systems	2		
7. Recap and check of the laboratory work	2		
Bibliography 1. Burnete N., V., Iclodean C., D., Jurchiș, B., M., Motoare cu ardere internă. Procese și management motor, Ed. UTPress, 2021 2. ***Robert Bosch GmbH, Bosch Automotive Handbook, Wiley, 2018 3. ***AVL Boost Manuals 4. ***MTZ Worldwide			
8.2. Project	Number of hours	Teaching methods	Notes
1. Presentation of project requirements	2	Presentations, applications	
2. Discussion of scientific papers in the field of the project and of the approach	2		
3. Gather experimental data	2		
4. Presentation of an initial model	2		
5. Optimization of the model	2		
6. Discussion of results	2		
7. Final verification and presentation of the project	2		
Bibliography 1. ***AVL Boost Manuals 2. ***https://www.sciencedirect.com/ 3. ***https://scholar.google.com/ 4. Mariașiu, F., Iclodean, C., Aplicații numerice în simularea motoarelor cu ardere internă, UTPress, 2016			

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

The accumulated competences are necessary for engineers working in research and developments, mechanical engineering etc. in the field of automotive engineering.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Theory and problem solving	Written evaluation.	60%
10.5 Seminars /Laboratory/Project	Appreciation of the work done during the laboratories	Check of the laboratory work and presentation of a research report	40%

10.6 Minimum standard of performance
Identify and sketch the components of internal combustion engine systems Describe the operation of internal combustion engine systems Process the experimental data according to the laboratory requirements Analyze the characteristics of internal combustion engine systems Turning in a project that covers at least the following: 1. Formatting of the document according to the requirements 2. Introduction chapter with a short description of what has been done in this project, what where the objectives and the applied methodology 3. Literature review chapter on the selected topic 4. Internal combustion engine simulation chapter containing a presentation of the model input data, methodology and initial simulation results 5. Results and discussions chapter containing an analysis of the influences on engine performance, efficiency, and pollutant emissions 6. Conclusions chapter

Date of filling in:		**Title Surname Name**	**Signature**
23.06.2025	Lecturer	Assoc. Prof. PhD Eng. Nicolae Vlad BURNETE	
	Teachers in charge of application	Assoc. Prof. PhD Eng. Nicolae Vlad BURNETE	
		Eng. Dorin Marius Stefan CAPATA	

Date of approval in the department ART 24.06.2025 _____	Head of department Prof.Ph.D.Eng. Barabás István
Date of approval in the faculty ARMM 25.06.2025 _____	Dean Prof.Ph.D.Eng. Filip Nicolae