SYLLABUS [1]

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	Politehnica University of Timișoara
1.2 Faculty[2]/ Department [3]	Faculty of Engineering Hunedoara / Engineering and Management
1.3 Chair	—
1.4 Field of study (name/code[4])	Automotive Engineering / 160
1.5 Study cycle	Bachelor Degree
1.6 Study program (name/code/qualification)	Road Vehicles / 30 / Engineer

2. Information about the discipline

2.1 Name of discipline/ formative category[5]	Processes and characteristics of internal combustion engines / DS						
2.2 Coordinator (holder) of course activities	Associate Professor, PhD. Rațiu Sorin-Aurel						
2.3 Coordinator (holder) of applied activities[6]	Associate Professor, PhD. Rațiu Sorin-Aurel						
2.4 Year of study[7]	III	**2.5** Semester	I	**2.6** Type of evaluation	E	**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	5 of which:	**3.2** course	3	**3.3** seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	70 of which:	**3.2*** course	42	**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	5 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			2
		training seminars / laboratories, homework and papers, portfolios and essays			2
3.7* Number of hours of unassisted activities / semester	70 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			28
		training seminars / laboratories, homework and papers, portfolios and essays			28
3.8 Total hours / week [10]	10				
3.8* Total hours /semester	140				
3.9 Number of credits	5				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• Fluid mechanics, Thermotechnics and thermal machines, Basics of automotive engineering

[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	• General knowledge of the components and the principle of operation of an internal combustion engine

5. Conditions (where applicable)

5.1 of the course	• Classroom equipped with video projector and computer with Internet connection; • Telephone conversations will not be tolerated during the course, nor will students leave the classroom to pick up personal telephone conversations.
5.2 to conduct practical activities	• Laboratory room with appropriate experimental equipment and stands; • The deadline for delivering the term papers is established by the course coordinator, in agreement with the students. Postponements will not be accepted for reasons other than those objectively justified; • Students are required to have printed laboratory guidance (existing in the faculty library) at each laboratory session.

6. Specific competencies acquired through this discipline

Specific competencies	• C3 • C3.1. Designing constructive solutions for vehicles, their subassemblies and special equipment, by applying basic principles and methods in the field of automotive engineering; • C3.2. Identifying and describing the basic concepts, theories and methods used in the design of road vehicles, their subassemblies and components; • C3.3. Identification and use of appropriate criteria and methods for evaluating the proposed construction solutions for meeting the functional requirements of road vehicles; • C3.4. Design of constructive solutions for road vehicles, subassemblies and their special equipment, to ensure the fulfillment of the functional requirements and the protection of the environment; • C3.5. Use basic knowledge to explain the different construction solutions of road vehicles (cars, special vehicles, construction vehicles), their subassemblies and special equipment.
Professional competencies ascribed to the specific competencies	• C3. Designing constructive solutions to ensure the fulfillment of the functional requirements of road vehicles.
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	• Gaining knowledge regarding the processes that take place in internal combustion engines and full understanding of their operation, from a thermogasodynamic perspective.
7.2 Specific objectives	• Acquiring the fundamental notions related to the processes of intake, compression, power/expansion and exhaust, both for the spark ignition engine (SI engine) and for the compression ignition engine (CI engine); • Acquiring the notions necessary to calculate each process; • Acquiring the notions necessary to achieve heat balance; • Acquiring the knowledge necessary to raise the characteristics of the engines on the test stands; • Acquiring the skills to enable decisions regarding the process optimization in internal combustion engines.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. Introduction 1.1. ICE classification; 1.2. Components of ICE with reciprocating piston, operating principles; 1.3. Mixture formation; 1.4. Power, engine torque, efficiency, fuel consumption.	6	Video-projector assisted lecture, interactive discussions
2. Gas exchange processes 2.1. General notions; 2.2. Criteria for assessing the perfection of the filling; 2.3. Normal 4-stroke engine filling; 2.4. Wave phenomena that accompany the gas exchange processes; 2.5. Filling by supercharging; 2.6. Expeditious calculation of the gas exchange processes for the 4-stroke engine with normal intake; 2.7. Conclusions on the gas exchange processes.	12	
3. The compression process 3.1. General notions; 3.2. Compression investigation; 3.3. Factors influencing compression; 3.4. Compression calculation; 3.5. Conclusion on the compression process.	6	
4. The combustion process 4.1. Elements from the physicochemical bases of combustion; 4.2. Combustion in the spark ignition engine; 4.3. Combustion in the compression ignition engine; 4.4. Expeditious calculation of the combustion process; 4.5. Conclusions on the combustion process.	9	
5. The expansion process 5.1. General considerations; 5.2. Factors influencing the expansion process; 5.3. Expansion process parameters; 5.4. Expansion calculation; 5.5. Conclusions on the expansion process.	3	
6. Thermal calculation of the internal combustion engine. Thermal balance 6.1. General considerations; 6.2. Engine thermal balance; 6.3. Examples of thermal calculation of engines.	3	
7. Characteristics of internal combustion engines 7.1. General notions. Classification; 7.2. Adjustment characteristics; 7.3. Loss characteristic; 7.4. Load characteristic; 7.5. Speed characteristic; 7.6. Various characteristics.	3	

[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.).

Bibliography [13]

1. Raţiu, S., Mihon, L. – *Motoare cu ardere internă pentru autovehicule rutiere* – Procese şi caracteristici, Editura Mirton, Timişoara, 2008;
2. Negrea, V.D. – *Procese în motoare cu ardere internă* – Economicitate. Combaterea poluării, Volumul II, Editura Politehnica, Timișoara, 2003;
3. Gruneald, B. – *Teoria, calculul şi construcţia motoarelor cu ardere internă pentru autovehicule rutiere*, Editura Didactică şi Pedagogică, Bucureşti, 1980;
4. * * * - Bosch Automotive Handbook, 7th Edition, Wiley, 2007;
5. Negrea, V.D. – *Procese, caracteristici şi supraalimentarea motoarelor cu ardere internă*, Lito IPTVT, 1990;
6. Boboescu, Ghe., ș.a. – *Motoare pentru automobile și tractoare*, Vol. I, Teorie și caracteristici, Chișinău, Editura "Tehnica", 1996.

8.2 Applied activities [14]	Number of hours	Teaching methods
Laboratory	28	Individual study, identification of demonstration models, experimental measurements, analysis of experimental data
1. Training on safety rules, laboratory presentation;	2	
2. Functional parameters of an SI engine;	4	
3. The air filter as a constructive factor influencing the filling process of the engine;	2	
4. The influence of engine wear on the efficiency of fresh fluid compression;	2	
5. Spark delivery advance;	4	
6. Injection advance;	2	
7. Pressure in the combustion chamber. Recording the evolution of the pressure in the combustion chamber of a SI engine;	2	
8. Indicator diagram. Planimetering the indicator diagram of a SI engine.	2	
9. Pollution caused by the ICE;	2	
10. Characteristic of fuel consumption when idling;	4	
11. Virtual laboratory for the interactive study of the engine management system.	2	
Seminar	-	
Project	-	

Bibliography [15]

Raţiu, S. – *Motoare cu ardere internă pentru autovehicule rutiere* – Procese şi caracteristici – Experimente de laborator, Editura Mirton, Timişoara, 2009.

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

- The content of the discipline is in accordance with the syllabusses from other university centers in the country and abroad;
- In order to better adapt to the requirements of the labor market, the requirements expressed by potential employers were taken into account when preparing the syllabus. I

10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	- the correctness and completeness of the assimilated knowledge; - criteria regarding the attitudinal aspects: interest for individual study and	Written exam (duration of 2 hours) and oral evaluation.	The grade for the exam has a share of 60% in the final grade.

[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.
[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.)

	professional development; - use of specific engineering language; - course attendance.		
10.5 Applied activities	**S:**		
	L: - mastering the problems treated in the laboratory; - the ability to exemplify the assimilated notions; - mastering the experimental methodology; - presentation of complete papers for each practical session; - presence, degree of interactivity and involvement in the practical part.	The evaluation of the applied activities is done by cumulating the qualifications obtained for: - term papers; - solving a test containing at least 10 questions from the problems covered in the laboratory; - the quality of the student's performance during the laboratory classes.	The grade for the applied activity – laboratory – has a share of 40% in the final grade.
	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])			
• Constant interest shown in acquiring the notions of the discipline; • Minimum theoretical knowledge of the basics related to processes in internal combustion engines; • Practical ability to identify and monitor process-specific parameters in internal combustion engines.			

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.