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]	Auxiliary systems of road vehicles / 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. Alexa Vasile						
2.4 Year of study[7]	III	**2.5** Semester	II	**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	3 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	1
3.1* Total number of fully assisted hours / semester	42 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	14
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 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			1
3.7* Number of hours of unassisted activities / semester	56 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			14
3.8 Total hours / week [10]	7				
3.8* Total hours /semester	98				
3.9 Number of credits	4				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• Fluid mechanics, Basics of automotive engineering, Processes and characteristics of internal combustion engines, Electrical and electronic equipment of road vehicles

[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 to auxiliary systems corresponding to engines, on the one side, and the vehicle as a whole, on the other.
7.2 Specific objectives	• Acquiring the fundamental notions related to the supply of SI engines (carburetion, electronic management of gasoline injection) and of CI engines (classic systems, with individual pump-injector unit, common-rail); • Acquiring the basic notions related to engine supercharging; • Acquiring the notions related to lubrication systems; • Acquiring the notions related to cooling systems; • Acquiring the notions related to starting systems; • Acquiring the notions related to air conditioning systems.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. Carburetion supply systems 1.1. General notions; 1.2. The principle of the elementary carburetor; 1.3. Real carburetor, elementary carburetor adjustment characteristic correction devices; 1.4. Real carburetor with pneumatic braking.	4	Video-projector assisted lecture, interactive discussions
2. Gasoline injection fuel systems. Electronic injection management 2.1. General notions; 2.2. Multipoint injection management; 2.3. Direct gasoline injection; 2.4. Ignition systems; 2.5. Bosch Motronic System; 2.6. Classic Bosch gasoline injection systems.	6	
3. Diesel fuel systems. Diesel engine management 3.1. Functional features of the diesel engine; 3.2. Diesel combustion chambers; 3.3. Diesel engine air supply; 3.4. Fuel supply; 3.5. Classic systems with in-line injection pump; 3.6. Classic injection pump systems with rotary dispenser; 3.7. Injectors used in conventional diesel injection systems; 3.8. Systems with individual pump-injector unit; 3.9. Common-rail systems.	8	
4. Lubrication systems for internal combustion engines 4.1. Introduction; 4.2. Lubricating oils used in vehicles; 4.3. Components of lubrication systems; 4.4. Construction and operation of lubrication systems; 4.5. Electronic management of lubrication systems.	2	
5. Cooling systems of internal combustion engines 5.1. Introduction; 5.2. Classification of cooling systems of thermal engines; 5.3. Liquid cooling systems; 5.4. Coolants; 5.5. Air cooling systems.	2	
6. Supercharging systems of internal combustion engines 6.1. Theoretical bases of supercharging; 6.2. Ways to achieve supercharging; 6.3. Turbocharging; 6.4. Intermediate air cooling.	2	
7. Starting systems 7.1. Constructive-functional types of starting systems; 7.2. Electric start system; 7.3. Stop-start system.	2	
8. Air conditioning systems 8.1. History of air conditioning systems on vehicles, definitions, terminology, thermal comfort; 8.2. Principle of operation and construction of the air conditioning system of a vehicle.	2	

[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., Alexa, V. – *Sisteme auxiliare ale autovehicule rutiere* – Editura Politehnica, Timişoara, 2017;
2. Stratulat, M., Copae. I – Instalaţii de alimentare cu benzină, Editura Militară Bucureşti, 1990;
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. * * * - Diesel-Engine Management – Systems and Components, 4th Edition, Wiley, Robert Bosch GmbH, 2005.

8.2 Applied activities [14]	Number of hours	Teaching methods
Laboratory	14	Individual study, identification of demonstration models, experimental measurements, analysis of experimental data
1. Training on safety rules, laboratory presentation;	1	
2. The study of the air flow through the carburetor. Plotting the ∆pd and ∆ps dependencies according to the φ position of the shutter and the speed;	2	
3. Simulation of multipoint injection using a virtual application, performed in the LabVIEW programming environment;	2	
4. Simulation of classical (mechanical) diesel injection for an injection pump system with rotary distributor and axial piston;	2	
5. Study of the lubrication system;	1	
6. Study of the cooling system;	1	
7. Simulation of the operation of a turbocharger with bypass valve and one with variable geometry;	2	
8. Starter system with starter. The role and operation of the starter;	2	
9. Air conditioning systems.	1	
Seminar	-	
Project	-	

Bibliography [15]

1. Raţiu, S., Alexa, V. – *Sisteme auxiliare ale autovehiculelor rutiere*, Editura Politehnica, Timişoara, 2017.

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 professional development; - use of specific engineering language; - course attendance.	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.)

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 the internal combustion engine supply; • Practical ability to identify and monitor parameters specific to the auxiliary systems of road vehicles.			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
04.09.2017	……	……
Head of Department (signature)	**Date of approval in the Faculty Council** [19]	**Dean (signature)**
……	06.09.2017	……

[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.