

DISCIPLINE FILE

MATERIALS AND SUSTAINABLE MANUFACTURING

1. Program information

1.1	Higher education institution	National University of Science and Technology Politehnica Bucharest, Pitesti University Center
1.2	Faculty	Mechanics and Technology
1.3	Department	Automobiles and Transport
1.4	Field of studies	Automotive Engineering
1.5	Cycle of studies	Master
1.6	Program of study / Qualification	Automotive Engineering for Sustainable Mobility

2. Discipline information

2.1	Name of discipline	MATERIALS AND SUSTAINABLE MANUFACTURING									
2.2	Teacher of the course activities	Conf. dr. ing. Sorin ILIE									
2.3	Teacher of the seminar activities	Conf. dr. ing. Sorin ILIE									
2.4	Year of the studies	I	2.5	Semester	II	2.6	Type of evaluation	C	2.7	The discipline regime	O-D

3. Estimated total time

3.1	Number of hours per week	2	3.2	from which course	1	3.3	laborator	1
3.4	Total hours of the Academic Syllabus	28	3.5	from which course	14	3.6	laborator	14
Distribution of the time allocated to the individual study								hours
Study by handbook, course support, bibliography and notes								25
Additional documentation in the library, on specialized electronic platforms and in the field								28
Preparation of seminars / laboratories, topics, reports, portfolios, essays								18
Tutorial								10
Examinations								10
Other activities								6
3.7	Total hours of individual study			125				
3.8	Total hours per semester ²			97				
3.9	Number of credits allocated to the discipline			5				

4. Preconditions (where applicable)

4.1	Curriculum	Materials science, Materials technology, Technical drawing, Computer aided design
4.2	Skills	Manufacture and repair of motor vehicles, Construction and calculation of motor vehicles, Engines for motor vehicles

5. Conditions (where applicable)

5.1	For the course	Classroom equipped with blackboard, computer and video projector
5.2	For the seminar	Laboratory room equipped with blackboard, computer and video projector, texts / sketches / tables / graphs, layouts / models / stands, internet access.

6. Specific skills acquired

Professional skills	<ul style="list-style-type: none"> - Defining basic concepts, theories and methods in the fundamental field of engineering sciences, as well as their proper use in professional communication; - Use of basic theoretical and experimental knowledge for the analysis and explanation of the technological processes of sustainable manufacture of vehicles; - Elaboration of professional projects with the coherent use of the specific theories and methods of manufacture in the engineering of vehicles; - Use of basic principles and methods for constructing models specific to the field of sustainable manufacturing of vehicles; - Solving a complex problem in the field of sustainable manufacturing of vehicles; - Identification and use of the criteria and methods suitable for choosing the materials that will ensure the fulfillment of the constructive and functional requirements of the vehicles under conditions of sustainability
transversal skills Transversale	<ul style="list-style-type: none"> - The application of the techniques of relation and efficient work in the multidisciplinary team (engineers of different formations, architects, urban planners, biologists, statisticians, mathematicians, economists), on different hierarchical levels, within the working group, promoting the spirit of initiative and creativity; - Objective and permanent self-assessment in broadening the level of knowledge in the field (marked by interdisciplinarity), the use of modern information technologies in documentation and learning, including in a language of international circulation. - Achieving personal and professional development, efficiently using their own resources and modern study tools.

7. Objectives of the discipline

7.1 The main objective of the discipline	The general objective of the discipline is knowing by the master students of the materials used in the construction of modern cars, as well as the learning of the methods, processes and technologies specific to their manufacture.
7.2 Specific objectives	At the end of the <i>Materials and Sustainable Manufacturing</i> course, the master student must be able to: <ul style="list-style-type: none"> - knows the importance of using modern materials and technologies in the manufacture of vehicles: the need for lighter, more durable and more durable materials in order to reduce the weight of the car, with all the advantages resulting from it: reducing consumption, pollution, etc .; - acquire the modern technologies and materials for different components of the car: body, motorcycle engine, axles and suspension; - knows the defectoscopic methods specific to the manufacture of auto parts; - learn the modern methods of complex three-dimensional control.

8. Contents

8.1. Cours		No. hours	Teaching methods	Remarks Resources used
1	Evolution of technologies and use of materials in the construction of vehicles. Preferential fields of use of modern materials and technologies in the automotive industry. Classification of modern processing materials and methods	1	<i>Lecture</i> <i>Explanation</i> <i>Debate</i>	<i>Board</i> <i>Computer</i> <i>Video projector</i>
2	The role of advanced materials technology in automotive manufacturing	1		
3	Dispersion of the materials used in a representative modern vehicle. Developments to improve the materials used in the manufacture of the main components of the modern vehicle: bodywork, motorcycle engine group, interior and exterior equipment	2		
4	Lightweight: The concept of lightweight construction using smart materials	1		
5	High-strength plastics technology for structural components of the body	2		
6	Non-conventional materials and technologies for the powertrain group	2		
7	Development of materials for components subjected to a high degree of thermo-mechanical efforts	1		
8	Concepts of material and surface coatings with consequences on reducing friction and wear in the engine group.	1		
9	Development of materials and concepts that lead to the reduction of weight of the motor-propulsion group	2		
10	Modern materials and technologies for decks and suspension	1		
TOTAL HOURS		14		

8.2. Application - Laboratory		No. hours	Teaching methods	Remarks Resources used
1	Statistical control of the accuracy of the car parts processing	2	<i>Explication</i> <i>Description and exemplification</i> <i>Debate</i> <i>Case study</i> <i>The exercise</i>	<i>Board</i> <i>Computer</i> <i>Video projector</i> <i>Internet Access</i> <i>Texts, sketches, tables, graphs</i> <i>Models, models, stands</i>
2	The geometric precision of machine tools for the manufacture of auto parts: the case of the milling machine (practical determinations, adjustments, measurements, calculations)	2		
3	The geometric precision of machine tools for the manufacture of auto parts: the case of the lathe (practical determinations, adjustments, measurements, calculations)	2		
4	Structural analysis of the working devices used in the automotive parts manufacturing technologies (measurements, determination of the accuracy of the devices)	2		
5	Manufacture of car parts from plastics, practical applications (working visits through collaboration protocols with companies in the field)	2		
6	Defect control in the manufacture of auto parts: methods, experimental determinations, etc.	2		
7	Complex three-dimensional control using the 3D measuring arm: knowledge of the methodology, knowledge of the 3D measuring arm, 3D measurements made on car parts and comparison with the virtual models stored in the computer	2		
TOTAL HOURS		14		

Minimal bibliography:

- Ilie, Sorin - Course notes.
- Fredrik Henriksson, Introducing New Materials in the Automotive Industry Managing the Complexity of Introducing New Materials in Existing Production Systems, Linköping 2017.
- Gaudillat, P.F. Antonopoulos, I.S. Dri, M. Canfora, P. Traverso, M., Best Environmental Management Practice for the Car Manufacturing Sector, ISBN 978-92-79-77070-8 ISSN 1831-9424 doi:10.2760/202143, 2017.
- Center for Automotive Research, Automotive Technology: Greener Products, Changing Skills - Lightweight Materials & Forming Report, 2011.
- Sustainable Materials in Automotive Applications, ISSN: 0148-7191, e-ISSN: 2688-3627, DOI: <https://doi.org/10.4271/2001-01-3762>, Published November 12, 2001 by SAE International in United States.

9. Corroboration the contents of the discipline with the expectations of the epistemic community representatives, professional associations and employers in the field related to the program

The skills acquired in this discipline allow the graduates to work in the field of automotive engineering:

- *knowledge of the preferential fields of use of modern materials and technologies in the motor vehicle industry;*
- *the ability to integrate into the technological processes certain operations in which innovative materials and technologies are used;*
- *the ability to know and apply modern methods in sustainable manufacturing.*

10. Evaluation

Activity type	10.1 Evaluation Criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Final evaluation	Written and oral exam	30 %
10.5 Laborator	Preparation of reports of laboratory work. Involvement in activities throughout the semester	Questions Individual discussions	30 %
10.6. Work for home	The correctness of the solution, the originality of the solutions	Oral presentation Individual discussions	40 %
10.6 Minimum standard of performance	<i>- the correct understanding of the concept of sustainable manufacturing in the automotive industry;</i> <i>- knowledge of the main modern materials used in the sustainable manufacture of vehicles;</i> <i>- knowledge of the concept of light construction using intelligent materials.</i>		

Date of completion
26.01.2024

Teacher of the course
CONF.DR.ING. Sorin ILIE

Teacher of the laborator
CONF.DR.ING. SORIN ILIE

Date of approval in the Department Council,
31.01.2024

Head of department,
(supplier)
Ș.I.dr.ing. H ȘUSTER BĂDĂRĂU

Head of department DAT,
Ș.I.dr.ing. H ȘUSTER BĂDĂRĂU