# SYLLABUS

## 1. Data about the program of study

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| 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 | 8.00 |

## 2. Data about the subject

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| 2.1 Subject name | | | | Internal Combustion Engines and Transmissions/Vehicle Powertrain CAD/CAE | | |
| 2.2 Course responsible/lecturer | | | | Lecturer. Ph.D. Emilian Borza –Emilian.Borza@auto.utcluj.ro | | |
| 2.3 Teachers in charge of seminars | | | | Lecturer. Ph.D. Emilian Borza –Emilian.Borza@auto.utcluj.ro | | |
| | | | | | | |
| 2.4 Year of study | I | 2.5 Semester | 2 | 2.6 Assessment | | E |
| 2.7 Subject category | Formative category | | | | | DS |
| | Optional | | | | | DI |

## 3. Estimated total time

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|---|---|---|---|---|---|---|---|---|---|---|
| 3. Number of hours per week | 3 | of which: | 3.2 Cours | 1 | 3.3 Seminar | | 3.3 Laboratory | 2 | 3.3 Proiects | |
| 3.4 Total hours in the curriculum | 42 | of which:: | 3.5 Cours | 14 | 3.6 Seminar | | 3.6 Laboratory | 28 | 3.6 Proiects | |

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| 3.7 Distribution of time fund (hours per semester) for: | |
| (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 | 10 |
| (d) Tutoring | 5 |
| (e) Exams and tests | 3 |
| (f Other activities: | - |

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| 3.8 Total hours of individual study (sum (3.7(a)...3.7(f))) | 58 |
| 3.9 Total hours per semester (3.4+3.8) | 100 |
| 3.10 Number of credit points | 4 |

## 4. Pre-requisites (where appropriate)

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| 4.1 Curriculum | |
| 4.2 Competence | |

## 5. Requirements (where appropriate)

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| 5.1. For the course | |

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| 5.2. For the applications | |

**6. Specific competences**

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| Professional competences | Systems architecture knowledge of computer aided design.<br>Appropriating methods of computer aided design using 3D geometric modeling set up. Knowledge of geometric modeling methods used in computer aided design. Identification of the computer aided design of connections with other computer-assisted like CAE.<br>After discipline students will be able:<br>-to choose the right design goal;<br>-to create 3D models of average complexity, using Catia software packages;<br>-to analyse and simulate a mechanical components with Catia software packages;; |
| Cross competences | After discipline students will be able to:<br>- to use of the computer as a tool for design and engineering representation, in compliance with ISO and EN in the field of computer-aided design;<br>-to use the peripheral elements within systems of computer-aided design;<br>-to know the possibilities and limitations of using various packages of computer aided design. |

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

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| 7.1 General objective | • Learning by the students to the concept of Computer Aided Design<br>• Knowledge of the latest generation of computer aided design, with applications in motor vehicle engineering |
| 7.2 Specific objectives | • Creating practical skills necessary for the operation of the Computer Aided Design systems |

**8. Contents**

| 8.1 Lecture (syllabus) | Nr. hours | Teaching methods | Notes |
|---|---|---|---|
| 1.CAD process in Vehicle Powertrain development. | 2 | Cours onsite | |
| 2.Catia V6. Product Life Management | 2 | | |
| 3.CAE process in Vehicle Powertrain development. | 2 | | |
| 4.Data exchange between CAD and CAE software. | 2 | | |
| 5.Analysis and Simulation in CAE for a Vehicle Powertrain | 4 | | |
| 6.Digital Mock-up(DMU) for a Vehicle Powertrain | 2 | | |
| 7.Digital Prototyping in automotive development | 2 | | |

Bibliography


1. BORZA Emilian, *Proiectare asistată de calculator*, Cluj-Napoca, Ed. UTPRESS, 2009
2. BORZA Emilian, *Caroserii şi structure portante. Construcţie*, Cluj-Napoca, Ed. Napoca Star, 2011
3. BORZA Emilian, *Caroserii şi structure portante. Calculul şi simularea structurii carseriei*, Cluj-Napoca, Ed. Napoca Star, 2011
4. BORZA Emilian, *Proiectarea asistată de calculator a caroseriilor automobilelor*, Cluj-Napoca, Ed. Napoca Star, 2012
5. BORZA Emilian, *Proiectarea asistată de calculator a automobilelor utilizând ingineria inversă*, Cluj-Napoca, Ed. Napoca Star, 2013

6. BORZA Emilian, *Proiectarea şi optimizarea asistată de calculator a automobilelor cu programe Computational Fluid Dynamics*, Cluj-Napoca, Ed. Napoca Star, 2014
7. BORZA Emilian, *Tehnici avansate de modelare şi simulare CAD/CAM a automobilelor*, Cluj-Napoca, Ed. Napoca Star, 2015
8. K.Learning, Catia V6 Essentials, Jones & Bartlett Learning, 2009

| 8.2 Applications/Seminars | Nr. hours | Teaching methods | Notes |
|---|---|---|---|
| 1.Introduction to Catia. Sketcher module; | 2 | Computer, onsite | |
| 2.Catia 3D modelling. Engines blocks ( V8, V10, V12) , race pistons, Connecting rod, piston pin, rings, bearings; | 2 | | |
| 3.Catia 3D modelling. Cylinder head( V8, V10, V12) , race valve train | 2 | | |
| 4.Catia 3D modelling. Modern Gearbox parts, multidisc clutch; | 4 | | |
| 5.Catia CAM. *CNC Programming. Race piston* | 2 | | |
| 6-7.Catia 3D Surfaces. Carbon Engine Noise Insulator | 4 | | |
| 8-9.Catia Assembly module. Engines blocks ( V8, V10, V12)- Connecting rod-Piston pin-Piston-Rings-Bearings; | 4 | | |
| 10.Catia Drafting. Functional Tolerancing & Annotation. Assembly Piston- Connecting rod- piston pin- rings, bearings; Tolerancing chain | 2 | | |
| 11.CFD Simulation. Engines blocks cooling system ( V8, V10, V12); | 2 | | |
| 12.CFD Catia Analysis and Simulation. Gearbox main shaft;Simulation. Cylinder head ports flow ( V8, V10, V12 | 2 | | |
| 13.Catia Analysis and Simulation. Gearbox main shaft; | 2 | | |
| 14.Checking laboratory work. | 2 | | |

Bibliography

1. BORZA Emilian, *Proiectare asistată de calculator*, Cluj-Napoca, Ed. UTPRESS, 2009
2. Dassault System, Catia V5, Companion
3. K.Learning, Catia V6 Essentials, Jones & Bartlett Learning, 2009

http://www.3ds.com/products-services

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

The content of the current requirements of the discipline is responsible in designing automotive computer assisted engineering.

**10. Evaluation**

| Activity type | 10.1 Assessment criteria | 10.2 Assessment methods | 10. Weight in the final grade |
|---|---|---|---|
| 10.4 Cours | Exam | Onsite | 50% |

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| 10.5 Applications | Making a 3D model | Onsite | 50% |
| 3D modeling of a Vehicle Powertrain parts using CAD technology | | | |

| Date of filling in: | Teachers in charge | Title First Name NAME | Signature |
|---|---|---|---|
| 20.06.2025 | Cours | Lecturer. Ph.D. Emilian Borza | |
| | Applications | Lecturer. Ph.D. Emilian Borza | |
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| Date of approval in the department ART<br><br>24.06.2025 | Head of department<br>Prof.dr.ing. Barabás István |
| Date of approval in the Faculty Council<br>ARMM<br><br>25.06.2025 | Dean<br>Prof.dr.ing. Filip Nicolae |