Course guide
240212 - 240AU052 - Vehicle Dynamics

Last modified: 24/05/2025

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2019). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Lluís Roger i Casals

Others: Lluís Roger i Casals

PRIOR SKILLS

Basic knowledge of rigid body kinematics and dynamics (vectorial formulation).
Vehicle basic knwoledge
Vibration theory

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Apply knowledge of mathematics, physics and technology obtained through study, experience and practice, using critical reasoning to establish economically viable solutions to technical problems in the automotive sector
2. Perform, present and defend an original exercise performed individually before a university tribunal, consisting of a comprehensive project of Automotive Engineering professional nature which synthesize the skills acquired in the teachings

Generical:
3. Ability to apply appropriate knowledge of mathematical aspects, analytical, scientific, instrumental, technological and management, the resolution of the problems of the automotive
4. Develop independent learning skills to maintain and enhance the powers of Automotive Engineering, to allow the continued development of the profession.

Transversal:
5. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

6. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

TEACHING METHODOLOGY

Theoretical and pratical classes

LEARNING OBJECTIVES OF THE SUBJECT

General objectives:
General description of the vehicle. Masses and dimensions
Tires. Description and behavior
Suspensions. Description and behavior
Longitudinal stability
Transverse stability
Dump stability
Dynamic tests

STUDY LOAD

Type	Hours	Percentage
Hours small group	18,0	12.00
Hours large group	36,0	24.00
Self study	96,0	64.00

Total learning time: 150 h

CONTENTS

title eTyre description

Description:
content english

Related competencies :
CGAU 1. Ability to apply appropriate knowledge of mathematical aspects, analytical, scientific, instrumental, technological and management, the resolution of the problems of the automotive

Full-or-part-time: 4h
Theory classes: 4h

Tyre bevaviour

Description:
Tyre behaviour

Full-or-part-time: 4h
Theory classes: 4h

Description of the suspensions and their operation

Description:
Description of the suspensions and their operation

Full-or-part-time: 8h
Theory classes: 8h

Supension kinematics and dynamics

Description:
Supension kinematics and dynamics

Full-or-part-time: 9h
Theory classes: 9h

Vehicle dynamics

Description:
Longitudinal dynamics
Transversal dynamics
Roll over dynamics

Full-or-part-time: 9h 20m
Theory classes: 9h 20m

GRADING SYSTEM

NEP = Mark for the partial exam
NEF = Mark for the final exam
NL = Mark for the assignments
NTM1 = Mark for the monographic work 1
NTM2 = Mark for the monographic work 2

Final mark = 0,25 NEP + 0,05 NL + 0,15 NTM1 + 0,15 NTM2 + 0,4 NF
Re evaluation= 0,1 NL + 0,2 NTM1 + 0,2 NMT2 +0,5 NF

EXAMINATION RULES.

The exams will generally consist of a theoretical part and a practical part. The use of an official form will be allowed.
The deliveries will correspond to the practical application of the theoretical studies explained. There will be a minimum of 3 and they will be held in groups of up to 4 students.
The monographic works will constitute a summary of everything that will have been learned during the course. One of them (NTM1) will consist of the study of the masses of the vehicle and the tires of a real vehicle (with a vehicle chosen by the students and that will be done sewrvir for the whole course and also for the subject of planning of the product). Each group will have to work on a different vehicle. The second work NMT2 will be on the suspensions and will also include a study of the dynamics of the vehicle. The work NL1 will deal abaout the Pegaso trauck parked clse to Aula Capella and to soem of the F Students vehicles. This work will be inidividual.

BIBLIOGRAPHY

Basic:
- Abe, Masato. Vehicle handling dynamics : theory and application [on line]. 2nd ed. Amsterdam: Elsevier, 2025 [Consultation: 20/06/2025]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780081003909/vehicle-handling-dynamics. ISBN 9780081003732.
- Gillespie, T. D. Fundamentals of vehicle dynamics [on line]. revised edition. Warrendale: Society of Automotive Engineers International, 2021 [Consultation: 10/12/2025]. Available on: https://research-ebsco-com.recursos.biblioteca.upc.edu/c/ik5pvi/search/details/tnetwymz4r?db=nlebk&db=nlabk. ISBN 9781468601770.
- Jazar, Reza N. Vehicle dynamics: theory and application [on line]. 4rd ed. Cham: Springer, 2017 [Consultation: 17/09/2025]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=31881641. ISBN 9783031744587.
- Milliken, William F. Race car vehicle dynamics. Warrendale, PA: SAE, 1995. ISBN 1560915269.

RESOURCES

Other resources:
Lecture notes, exercises and short questions (Digital Campus)