# [GJC103] MACHINE AND MECHANICAL THEORY

## GENERAL INFORMATION

| | | | | | |
|---|---|---|---|---|---|
| **Studies** | DEGREE IN MECHATRONICS ENGINEERING | | | **Subject** | ? |
| **Semester** | 2 | **Course** | 1 | **Mention / Field of specialisation** | |
| **Character** | BASIC TRAINING | | | | |
| **Plan** | 2020 | **Modality** | Face-to-face | **Language** | CASTELLANO/EUSKARA |
| **Credits** | 6 | **Hours/week** | 5 | **Total hours** | 90 class hours + 60 non-class hours = **150 total hours** |

## PROFESSORS

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## REQUIRED PREVIOUS KNOWLEDGE

| Subjects | Knowledge |
|---|---|
| PHYSICS I | *(No previous knowledge required)* |
| MATHEMATICS I | |

## SKILLS

**VERIFICA SKILLS**

**SPECIFIC**

**GJCE02** - To understand and master basic concepts from the general laws of mechanics, thermodynamics, fields and waves and electromagnetism, applying them to engineering problems.

**CROSS**

**GJCTR2** - To be able to understand and apply knowledge to problem solving in complex work situations or specialised and professional environments calling for creative and innovative ideas, using self-developed arguments and procedures;

**BASIC**

**G_CB2** - To be able to apply knowledge to occupational or professional tasks; have the necessary skills to pose and defend arguments, and to solve problems within their field of study

**G_CB5** - To have developed learning abilities required to embark on subsequent studies with a high level of autonomy.

## LEARNING RESULTS

**RGJ181 They communicate, search and structure written information: they write a clear and concise project report following the criteria established in the guide for written reports using the appropriate software.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | 1 h. | 2 h. | 3 h. |

| EVALUATION SYSTEM | W |
|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 100% |

**MAKE-UP MECHANISMS**

*(No mechanisms)*

**Comments:** Revision and correction of the written report of the semester project

**CH - Class hours:** 1 h.
**NCH - Non-class hours:** 2 h.
**TH - Total hours:** 3 h.

**RGJ182 They communicate, search and structure orally the information correctly: they make a clear and concise oral presentation and defense of the project, considering the aspects gathered in the oral communication guide and using the proper software approp**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on | 2 h. | 2 h. | 4 h. |

projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

| EVALUATION SYSTEM | W |
|---|---|
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 100% |

**MAKE-UP MECHANISMS**

*(No mechanisms)*

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
**NCH - Non-class hours:** 2 h.
**TH - Total hours:** 4 h.

**RGJ191** **They use the right methodology to find solutions to problems and to develop projects: analyse problems properly, look for meaningful information to face them and propose solutions.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams | 2 h. | 2 h. | 4 h. |

| EVALUATION SYSTEM | W |
|---|---|
| Observation (technical capacity, attitude and participation) | 100% |

**MAKE-UP MECHANISMS**

*(No mechanisms)*

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
**NCH - Non-class hours:** 2 h.
**TH - Total hours:** 4 h.

**RGJ192** **They use the right methodology to find solutions to problems and to develop projects: analyse problems properly, look for meaningful information to face them and propose solutions.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams | 2 h. | 2 h. | 4 h. |

| EVALUATION SYSTEM | W |
|---|---|
| Self-assessment | 30% |
| Co-assessment | 35% |
| Observation (technical capacity, attitude and participation) | 35% |

**MAKE-UP MECHANISMS**

*(No mechanisms)*

**Comments:** Continuous assessment. Retake is not foreseen.

**CH - Class hours:** 2 h.
**NCH - Non-class hours:** 2 h.
**TH - Total hours:** 4 h.

**RGJ134** **They modelize, calculate and analyze the static equilibrium of structures and machines.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | 6 h. | 5 h. | 11 h. |
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 6 h. | | 6 h. |
| Carrying out exercises and solving problems individually and/or in teams | 6 h. | 4 h. | 10 h. |

| EVALUATION SYSTEM | W |
|---|---|

**MAKE-UP MECHANISMS**

| | | |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 100% | Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems |

**CH - Class hours:** 18 h.
**NCH - Non-class hours:** 9 h.
**TH - Total hours:** 27 h.

**RGJ135 They analyze the motion of a mechanism and establish the loads that determine its motion.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams | 12 h. | 4 h. | 16 h. |
| Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning | 4 h. | 14 h. | 18 h. |
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 25 h. | | 25 h. |
| Carrying out exercises and solving problems individually and/or in teams | 10 h. | 12 h. | 22 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 25% | Individual written and/or oral tests or individual coding/programming tests<br>**Comments:** Final mark: written second-chance exam (75%) + exam (25%). Laboratory practices and auto evaluations will be made-up by on-going evaluation. It is compulsory to submit the team-exercise, otherwise the result of the learning outcome will be 0. For marks under 5, there will be a posibility of a retake, with a maximum mark of 5. |
| Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems | 20% | |
| Individual written and/or oral tests or individual coding/programming tests | 55% | |

**CH - Class hours:** 51 h.
**NCH - Non-class hours:** 30 h.
**TH - Total hours:** 81 h.

**RGJ136 They understand the basic concepts of mechanical vibrations and analyze the vibratory movement of systems with one degree of freedom.**

| LEARNING ACTIVITIES | CH | NCH | TH |
|---|---|---|---|
| Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects | 10 h. | | 10 h. |
| Carrying out exercises and solving problems individually and/or in teams | 4 h. | 13 h. | 17 h. |

| EVALUATION SYSTEM | W | MAKE-UP MECHANISMS |
|---|---|---|
| Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems | 100% | Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems<br>**Comments:** It is compulsory to submit the team-exercise, otherwise the result of the learning outcome will be 0. For marks under 5, there will be a posibility of a retake, with a maximum mark of 5. |

**CH - Class hours:** 14 h.
**NCH - Non-class hours:** 13 h.
**TH - Total hours:** 27 h.

## CONTENTS

1. Static balance of 3D mechanical systems - Structures - Machines2. Analysis of mechanisms - Model of mechanisms - Kinematics of mechanisms - Kinetics of mechanisms3. Mechanical vibrations - Basis - Systems of one degree of freedom

## LEARNING RESOURCES AND BIBLIOGRAPHY

| Learning resources | Bibliography |
|---|---|
| Subject notes | Meriam J.L., Kraige L.G., Mecánica para Ingenieros. Dinámica, 3. argitaraldia, Reverté S.A. argitaletxea, 2014 |
| Moodle Platform | Beer F.P., Mecánica Vectorial para Ingenieros. Dinámica, 11. argitaraldia, McGraw-Hill argitaletxea, 2017 |
| Class presentations | Riley W. F. & Sturges L. D., Ingeniería Mecánica. Dinámica, Reverté S.A. argitaletxea, 1996 |
| | Bedford A. & Fowler W., Mecánica para Ingeniería. Dinámica, Addison-Wesley Iberoamericana argitaletxea, 2008 |
| | Shames I.H., Mecánica para Ingenieros. Dinámica, Prentice Hall Iberia argitaletxea, 1999 |
| | http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_lnk.pl?grupo=MECATRONICA12&ejecuta=10&_ST |