SUBJECT: CALCULATION OF MACHINE ELEMENTS

MATTER: Mechanical Engineering
MODULE: Specific Technology
STUDIES: Degree on Industrial Technologies Engineering

GENERAL CHARACTERISTICS *

Type: ☐ Basic training, ☑ Compulsory ☐ Elective

☐ End-of-grade ☐ External Internship

Duration: Semiannual   **Semester / s**7
Number of ECTS credits6
Language / s: Castilian, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The subject of machine element calculation is the tool used to dimension the integral parts of a machine subject to different types of static and dynamic stresses resulting from its operation.

The course aims to introduce students to the different standard elements used in the industry and each provide a standardized calculation process that allows proper sizing.

The course content includes as essential: design concepts and criteria for selection of materials for industrial machinery, calculation of transmissions with gears, belts and pulleys, chains ..., calculating coupling shafts and pins, keyways, interference, stretch marks ..., calculating flywheels and links between axles, brake and clutch designs, calculating bushings and bearings, joints between pieces with clips, springs, rivets, welding ..., threaded joints calculating ... calculating damped suspensions and benches.

COMPETENCES

- Ability to understand and apply the basic skills and include: computer graphic expression, mechanics and materials, necessary for the practice of industrial engineering (E2).
- Knowledge of the principles of the theory of machines and mechanisms (CRI7).

PREREQUISITES *

The competences of the earlier educational stages.

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CONTENTS

Theoretical:
1.   Introduction
Two.   Materials for machine elements
Three. Motion transmission elements
April. Trees and axes
5.   Bearings
June.   Fasteners
July.   Brackets

Practical:
1.   Introduction to spreadsheet programs: KISSsoft modelers and CAD / CAE
Two.   Calculating a motion transmission shaft with its bearings
Three. Calculation of transmission gears
April. Calculating a belt drive
5.   Calculation of shaft-hub connections
June.   Calculation of threaded joints
July.   Developing a two-stage gearbox

METHODOLOGY

TRAINING ACTIVITIES *

Training activities	ECTS credits	Competencies
Lectures presenting concepts, problem solving (A1)	2	E2, CRI7
Practical work / laboratory (A5)	1.2	E2, CRI7
Personal study activities by students (A7)	2.3	E2, CRI7
Evaluation activities (testing, monitoring controls, etc.) (A8)	0.2	E2, CRI7
Performing work, presentations (draft) (A9)	0.2	E2, CRI7
Visits to companies	0.1	E2, CRI7
TOTAL	**6**	

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EXPLANATION OF THE TEACHING METHODOLOGY

Most of the course sessions combined with expository parts giving practical parts places several models of interaction in the classroom. The dynamic model in which the teacher exhibition shows the contents, the dynamic model demonstration in which the teacher performs tasks and solve problems and active dynamic that the students must make a problem. This latest model is done both individually and as a group of students. New technologies allow the realization of all these meetings with laptops connector for sharing network projects and divide tasks among students in real time.

Furthermore, the subject provides a great deal of laboratories in which students are constantly working on her laptop in guided problem solving at the beginning and that they incorporate the knowledge for decision making becomes the student's responsibility.

For personal study the student has all the information in electronic format standardization as the subject requires constant consultation and regulatory boards.

EVALUATION

EVALUATION METHODS *

Evaluation Methods	Weight	Competencies
Final Exams (A)	40% (*)	E2, CRI7
Midterms / programmed controls (B)	15%	E2, CRI7
Classroom activities (C)	2%	E2, CRI7
Exercises done outside of class (D)	3%	E2, CRI7
Reports work done (E)	9%	E2, CRI7
Presentations and / or oral examinations (F)	1.5%	E2, CRI7
Modelling, projects, etc.. (G)	7.5%	E2, CRI7
Laboratory reports (H)	5%	E2, CRI7
Practical work / laboratory (I)	15%	E2, CRI7
Work done in other centers (Practicum) (J)		
Participation (K)	2%	E2, CRI7

The final exam has a minimum score of 5 out of 10.

LEARNING OUTCOMES

- The student must demonstrate that knows how to choose a suitable material for the manufacture of an element of a machine. (E2, CRI7) [A, B, C, D, E, F, G, H, I, K].
- The student must demonstrate that it is able to calculate the static and dynamic strength of an element of a machine. (E2, CRI7) [A, B, C, D, E, F, G, H, I, K].
- The student must demonstrate the ability to perform a complete draft of a machine integrating the different components that comprise it. (E2, CRI7) [A, B, C, D, E, F, G, H, I, K].

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QUALIFICATION

The evaluation of the course will consider all deliverables shown in the evaluation grid with its corresponding weight. A large part of the grade obtained in the Finals (A) 40% (with minimum score 5 out of 10) and is adding to the mark obtained during the course Midterms (B) 15%, Classroom activities (C) 2%, Exercises done outside of class (D) 3%, Reports work done (E) 9%, Presentations and / or oral examinations (F) 1.5%, Project Development, (G) 7.5%, Laboratory reports (H) 5%, Workshop and laboratory work (I) and finally 15% Participation (K) 2%.

During the final examination will be given the opportunity to recover all deliverables to which the student does not get the minimum score of four.

ASSESSMENT OF COMPETENCES

For the evaluation of the course competencies E2, CRI7 subsections will be used for each of the deliverables to facing the student during the course. In each deliverable part of the note reflected the ability to reflect the concepts of graphic expression in the deliverable (E2). To assess the knowledge of the principles of theory of machines and mechanisms (CRI7) will analyze the elements required for each deliverable machine. Ultimately each exercise to assess 10 points will be assessed on the note stating each competition.

TEXTBOOKS (Recommended and accessible to the student.)

- "Machine Design", Norton, Robert L., Pearson Prentice Hall, (1999), ISBN 0-13-897802-6
- "Mechanical Engineering Design", Shigley, Joseph E.; Mische, Charles R., Mc Graw Hill, (1998), ISBN 968-422-778-7 or ISBN 84-481-0817-5
- "Handbook of Practical Gear Design", Dudley, Send W., CRC Press, (1994), ISBN 1-56676-218-9
- "Machine elements" Dobrovolski, V.; Zablonski, K.; Radchik, A.; Erlij, L.; MIR Publishers, (1978);
- "Design of Machine Elements", Mott, Robert L., Pearson, (2006), ISBN 970-26-0812-0

HISTORICAL DOCUMENT

EARLIER CHANGES
January 23, 2011, Dr. Andrés Amador García Granada
November 12, 2010, Dr. Andrés Amador García Granada

LAST REVISION
March 8, 2011, Dr. Andrés Amador García Granada

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