ISEL
INSTITUTO SUPERIOR DE ENGENHARIA DE LISBOA

ISEL ADEM
Área Departamental de Engenharia Mecânica

Sheet course ()

Course	MSc IN MECHANICAL ENGINEERING		
Unit	Maintenance for Control Condition	Mandatory	☐
		Optional	☒
Unit scientific area	Industrial and Maintenance Engineering	Category	B

Unit category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 2nd	Semester: 1st		ECTS: 5			
Contact time	Total:	T:	TP: 45	PL:	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Unit Director	Title	Position
António Afonso Roque	Charter Engineer	Assistant Professor

Learning Objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

This course is aimed at learning the most current technologies , techniques and methods of evaluation and identification of damage in structures and machines , with the most common framework of predictive maintenance and learning of faults and their symptoms in industrial equipment . By learning technologies , techniques and methods should be understood to understand the physical principles that underlie the knowledge and some practice with the equipment and sensors used , the knowledge of the meaning of each of the parameters sensitive to the damage that can be used and the understanding and practical application of the methodology for detection and diagnosis in each technology.

Students acquire skills to use in practice the different technologies , most commonly used in industry for the identification and assessment of the state of damage in machines and structures and to define a maintenance program for condition monitoring .

Syllabus

(max. 1000 characters)

1. Introduction to condition monitoring

2. Predictive maintenance technologies: basic principles, damage sensitive parameters, sensores and equipment, measuring, detection and diagnostic, severity standards and trend analysis:

- Vibrations

- Process parameters
- Termography
- Electrical current analysis
- Fluid analysis
- Visual inspection
- Non-Destructive Evaluation
- Minimal squares method. Trend analysis

3. Faults and symptoms

• resonance, mass variation, variation of stiffness and damping variation in structures

• imbalance, misalignment, warping, loosening and clearances, critical velocity, resonance, hydraulic and aerodynamic faults in rotating machines

• Typical faults in internal combustion engines, electric motors, gears, belts and engine bearings,

4. Predictive maintenance program implementation

- Methodology
- Implementation

Demonstration of consistency of the syllabus with the objectives of the course (max. 1000 characters)
The contents have direct relevance to the objectives of the UC

Teaching methodology (evaluation included) (max. 1000 characters)
The program is exposed in classes using presentations, virtual simulators, finite element software, dynamic simulation software, mathematical calculation software, symbolic manipulators and didactic models in the laboratory. Classes are supported by a internet site where students find simulators, videos of previous lectures, tutorials, videos of software used in the lessons, self-assessment tests at the end of each chapter, advised sites and technical and scientific texts.

In addition to lectures seminars are organized where professionals in this area of knowledge transmit problems, practices and existing technologies..

The evaluation consists of three papers, one per month, and the exam.

Demonstration of consistency of teaching methods with the learning objectives of the course

(max. 3000 characters)

The use of practical examples in the laboratory, seminars, dynamic computer simulations and evaluation for practical work allows the assimilation of concepts that are predominantly characterized by movement.

Main Bibliography

(max. 1000 characters)

MOBLEY, R. K. An Introduction to Predictive Maintenance

VICTOR WOWK. Machinery Vibration: Measurement and Analysis