ENGINEERING FOR SAFETY OF CRITICAL INDUSTRIAL AND CIVIL

(Lecce - Università degli Studi)

Teaching DYNAMICS AND STABILITY OF MECHANICAL SYSTEMS

GenCod A007227

Owner professor MICHELE SCARAGGI

Teaching in italian DYNAMICS AND STABILITY OF MECHANICAL SYSTEMS

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SSD code ING-IND/13

Reference course ENGINEERING FOR SAFETY OF CRITICAL INDUSTRIAL AND

Course type Laurea Magistrale

Credits 6.0

Teaching hours Front activity hours: 54.0

For enrolled in 2024/2025

Taught in 2024/2025

Course year 1

Language ENGLISH

Curriculum INDUSTRIAL ENGINEERING SYSTEMS

Location Lecce

Semester Second Semester

Exam type Oral

Assessment Final grade

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION	The course is about the dynamics and stability of multibody mechanical sistems, with particular attention to their modelling and numerical resolution.
REQUIREMENTS	Knowledge of the fundamentals of analytical and applied mechanics is necessary
COURSE AIMS	The course aims: - to introduce a systematic approach to the writing of the equations of motion, for systems with n degrees of freedom, i.e. to the development of the mathematical model capable of defining the dynamic behaviour; - to introduce the fundamentals of tribology in mechanical systems; - to numerically solve the equations of motion for a multibody mechanical system; - to provide the knowledge necessary for the study of dynamic stability for systems with one degree of freedom subjected to force fields and introduction of the control action as a force field.
TEACHING METHODOLOGY	Frontal lectures, with the support of multimedial content and with the adoption of CAE software for multibody simulations. Lab activities.
ASSESSMENT TYPE	Oral examination and project

FULL SYLLABUS	Detailed program: - Dynamics: Lagrangian, momentum and energy conservation. - Rigid body and multi-body dynamics: Theory and computer-aided applications to complex mechanical systems. - Fundamentals of tribology: mechanics of friction, adhesion and lubrication. - Vibration dynamics of single degree of freedom (SDOF) systems: Theory of free and forced vibrations, with dissipation. Frequency response function. - SDOF Vibration dynamics: Applications to constraint oscillations, rotating eccentric mass. Damping identification methods: logarithmic decrement, resonance curve sharpness. - Equations of motion of a linearized mechanical system: Modelling considerations, types of inputs, solutions with Laplace transforms; study of the frequency response, Bode diagram of elementary functions, outline of linearization procedures, algebra of block diagrams. Equilibrium position stability analysis and dynamic stability analysis.
REFERENCE TEXT BOOKS	There are no specifically prescribed or recommended texts for this subject.