Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: APPLIED MECHANICS			
ACADEMIC YEAR: 2018-2019			
TYPE OF EDUCATIONAL ACTIVITY: Characteristic			
TEACHER: ELENA PIERRO			
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Language: ITALIAN			
ECTS: 9	n. of hours: 90 n. of hours of lessons: 86 n. of hours in laboratory: 4	Campus: POTENZA School: Scuola di Ingegneria Program: Ingegneria Meccanica	Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The aim of the course is to provide the basic methodologies to define and analyse the kinematic and dynamic behaviour of mechanical devices and systems.

The main concepts provided are:

- Fundamentals of mechanical systems and methods of theoretical mechanics;
- Planar mechanisms and friction;
- Gear and belt transmissions;
- Basic knowledge of transient behaviour of mechanical systems;
- 1 d.o.f. mechanical vibrations;

Main competences:

- To study the kinematics of rigid bodies in different equilibrium conditions;
- Dynamics of mechanical systems (mechanisms, gears, belt transmissions, vibrating systems);

The course enhances the knowledge and the understanding of the methods useful for the functional analysis of mechanical systems, in terms of kinematics and dynamics. The judgment autonomy is encouraged by means of seminars, exercises, and tests. Communicative abilities, oral and written, are particularly improved through organized seminars, training activities, with the aim to prepare written documents and their oral dissertation. Learning abilities are evaluated by means of tests during the training activities and by requiring self-collected data for the evaluation of the self-learning abilities matured during the final test activity.

PRE-REQUIREMENTS

Concepts of Physics and Mathematical Physics (Kinematics of a particle trajectory. Kinematics of rigid bodies. Dynamics of rigid bodies)

SYLLABUS

PRELIMINARY CONCEPTS ABOUT MECHANICS

Kinematics of a particle trajectory. Kinematics of rigid bodies. Relative Kinematics. Dynamics: cardinal equations. Dynamics of rigid bodies. Work, Kinetic Energy and Potential Energy. Conservation of Mechanical Energy.

KINEMATICS AND DYNAMICS OF PLANAR MECHANISMS

Crack slider mechanism, four bar linkage mechanism. Mechanisms for automatic machines. Open articulated systems.

FRICTION

Introduction to friction, sliding friction, friction in mechanisms. Rolling friction, self-locking phenomenon. Examples. Introduction to brakes.

BELT TRANSMISSIONS

Belt typologies, flat and V-belts, tooth belts, pulleys. Fundamental equation of belt transmissions. Belt tensioning. Maximum transmissible torque and power. Examples

GEARS AND GEAR-BOXES

Typologies, tooth profiles. Geometry of cylindrical gears. Minimum tooth number. Helicoidal gears. Conical gears. Forces between teeth. Fixed-ratio gear-boxes. Planetary gear boxes. Conical differential gear. Examples.

TRANSIENT BEHAVIOUR OF MECHANICAL SYSTEMS

Motor-load coupling dynamics: direct motion, inverse motion, influence of gear box, influence of friction clutch. Cyclic motion. Irregularities in cyclic motion and fly wheel design.

MECHANICAL VIBRATIONS

Classical solutions of differential equations. Time and frequency domain analysis. 1 DOF free and forced vibrations, support motion forced vibration, mass unbalance forced vibrations. Transmissibility and vibration isolation.

TEACHING METHODS

Theoretical lessons (86 hours)
Laboratory tutorials (4 hours)

EVALUATION METHODS

The examination consist of a written test so structured:

- One exercise on planar mechanisms (12 points)
- One exercise on belt transmissions “or” gear boxes (6 points)
- One exercise on mechanical vibrations (12 points)
- One theoretical question (4 punti)

The final score is the sum of the 4 parts. The minimum score to pass the examination is 18/30. The student that obtains at least 18/30 at the written test can ask for an oral examination. The final score will be the mean value between the written and oral parts.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Educational material available in the shared folder (contact the teacher to register) and exercises available at the web page (http://www2.unibas.it/epierro/MAM.html).

Textbooks:

- Jacazio, Pastorelli, Meccanica Applicata alle Macchine, Ed. Levrotto & Bella, Torino.
- Callegari M., Fanghella P., Pellicano F., Meccanica Applicata alle Macchine, Ed. Città Studi, Torino.
- Funaioli E., Maggiore A., Meneghetti U., Lezioni di Meccanica Applicata alle Macchine, Vol. 1. Patron Ed., Bologna.
- Jacazio G., Piombo B. "Meccanica applicata alle Macchine", Vol. 1, 2 e 4 Ed. Levrotto & Bella, Torino.
- Thomson W. T. "Theory of Vibration with Application", IV Ed. Chapman & Hall – London

INTERACTION WITH STUDENTS

During the first lessons, the teacher shows the educational goals and expected learning outcomes, the syllabus and all the details of the course (evaluation methods …). Then, the teacher takes the list of the students to share a folder where the lessons and further educational material will be uploaded.

PROFESSOR’S OFFICE HOUR: Thursday, 09.30 Floor V, room 75

EXAMINATION SESSIONS (FORECAST)[1]

01/02/19, 22/02/19, 17/05/19, 28/06/19, 19/07/19, 27/09/19, 25/10/19, 22/11/19

SEMINARS BY EXTERNAL EXPERTS YES

FURTHER INFORMATION

[1] Subject to possible changes: check the web site of the Teacher or the Department/School for updates.