UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria		
ACADEMIC YEAR	2019/2020		
MASTER'S DEGREE (MSC)	BUILDING ENGINEERING		
INTEGRATED COURSE	EXPERIMENTAL DYNAMICS AND MONITORING - INTEGRATED COURSE		
CODE	17514		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	ICAR/08, ICAR/06		
HEAD PROFESSOR(S)	DI MATTEO ALBERTO	Ricercatore a tempo determinato	Univ. di PALERMO
OTHER PROFESSOR(S)	LO BRUTTO MAURO	Professore Associato	Univ. di PALERMO
	DI MATTEO ALBERTO	Ricercatore a tempo determinato	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**DI MATTEO ALBERTO** Friday 15:00 18:00 Ufficio, 1° piano Area Strutture **LO BRUTTO MAURO** Monday 09:00 12:00 Dipartimento di Ingegneria - Area Geomatica - viale delle Scienze - Edificio 8 - scala F6 - secondo piano. Tuesday 09:00 12:00 Dipartimento di Ingegneria - Area Geomatica - viale delle Scienze - Edificio 8 - scala F6 - secondo piano.		

DOCENTE: Prof. ALBERTO DI MATTEO

PREREQUISITES	Dynamics of systems with more than one degree of freedom. Dynamics of continuous systems. Frequency domain analysis. Aleatoric dynamics. Topographical measurement notions.
LEARNING OUTCOMES	Knowledge and understanding The student, at the end of the course, will have acquired knowledge and methods to address and solve in an original way problems related to the monitoring of structural vibrations in both civil, mechanical and aerospace field. Applying knowledge and understanding The student at the end of the course will be able to independently develop vibration monitoring projects together with methodologies for the study of the effects induced by vibrations. Making judgments The student will be able to critically analyze and evaluate effectively the risk of any records of structural vibrations Communication The student will be able to communicate competently and with appropriate terms complex problems of mechanical language of vibrations even in highly specialized settings. Learning skills -The student will be able to deal autonomously issues related to the dynamics of structures and monitoring. -The student will be able to analyze complex issues such as: the dynamic response of structures even with non-linear behavior, the dynamic stability of complex systems, the dangerous effect induced by vibration to operators using some machines.
ASSESSMENT METHODS	Oral exam and presentation of a Case study. The vote is expressed in thirtieths with possible praise, according to the scheme reported at the bottom of the degree program homepage, i.e. "Metodi di valutazione". The presentation of the Case study will be related to the topics discussed during the course, such as: monitoring of structural vibrations in civil, mechanical or aerospace engineering field, control and stability of complex systems, vibration induced effects, sensors and testing devices, BIM modeling.
TEACHING METHODS	Lectures, practical exercises, workshops, and webinars. The lessons will be in English.

MODULE
MODULE 1 - INTEGRATED COURSE EXPERIMENTAL DYNAMICS AND MONITORING

Prof. ALBERTO DI MATTEO

SUGGESTED BIBLIOGRAPHY

Vibration Monitoring, Testing, and Instrumentation Edited by Clarence W. de Silva The University of British Columbia Vancouver, Canada Ltfi) CRC Press VV^ J Taylor & Francis Group Boca Raton London New York CRC Press is an imprint of the Taylor & Francis Group, an informa business© 2007

AMBIT	20562-A scelta dello studente
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The course, which will be given in English, aims at providing the criteria and methods for the design of any structural monitoring system, even from remote.

SYLLABUS

Hrs	Frontal teaching
3	Sampling and acquisition of signals
3	Basics of Signal analysis
2	Displacements and accelerations measurement devices
2	Contact-less vibration measurements: single point contact and Laser Scanner Vibrometer
3	Tools for structural excitation: Shaker, shaking tables and impact hammers
4	Analysis of single and multi degree of freedom dynamical systems in time domain and frequency domain
4	Identification methods for single degree of freedom systems
4	Identification methods for multi degree of freedom systems
3	Contact-less vibration measurements for structures: Radar Interferometer

Hrs	Practice
3	Vibration tests
4	Experimental modal analysis
3	Monitoring
4	Experimental setup for remote control and monitoring
3	Seismic base isolation and vibration control
3	Case study: monitoring “Palazzo Steri”
4	Guided Skype experiment with national and international experimental dynamics laboratory

MODULE
MODULE 2 - INTEGRATED COURSE EXPERIMENTAL DYNAMICS AND MONITORING

Prof. MAURO LO BRUTTO

SUGGESTED BIBLIOGRAPHY	
Materiale didattico fornito dal docente, dispense, articoli riviste	
AMBIT	20562-A scelta dello studente
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The Monitoring module is aimed to give information on the most important Geomatics techniques for the geometric analysis of buildings and structures. Through the most modern approaches, students will be able to know the main monitoring techniques through drones proximity sensing, satellite radar interferometry, thermography and modelling in BIM environment.

SYLLABUS

Hrs	Frontal teaching
7	InSAR and InSAR Differential techniques for estimating small displacements
7	Theoretical concepts of thermography. Emission, reflection, transmission and absorption. Methods for determining the surface emissivity. Thermographic inspection.
8	Building modelling in BIM environment: 3D modelling, interoperability, building life cycle, italian legislation (D.M. 560/2017). Concept design and construction, facility management.
6	UAS (Unmanned aerial systems) for buildings modelling. Flight planning, sensors, images processing.

Hrs	Practice
6	Displacement estimation by InSAR techniques
5	Practical exercise: indoor thermographic inspection. Thermographic data processing.
7	Building modelling exercise in BIM environment
5	Geometric and radiometric processing of a proximity sensing image acquired via UAS
1	Case study analysis