



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Ingegneria		
<b>ACADEMIC YEAR</b>	2022/2023		
<b>MASTER'S DEGREE (MSC)</b>	CIVIL ENGINEERING		
<b>INTEGRATED COURSE</b>	EXPERIMENTAL DYNAMICS, MONITORING AND BIM - INTEGRATED COURSE		
<b>CODE</b>	21624		
<b>MODULES</b>	Yes		
<b>NUMBER OF MODULES</b>	2		
<b>SCIENTIFIC SECTOR(S)</b>	ICAR/08, ICAR/06		
<b>HEAD PROFESSOR(S)</b>	LO BRUTTO MAURO	Professore Associato	Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	LO BRUTTO MAURO MASNATA CHIARA	Professore Associato Ricercatore a tempo determinato	Univ. di PALERMO Univ. di PALERMO
<b>CREDITS</b>	12		
<b>PROPAEDEUTICAL SUBJECTS</b>			
<b>MUTUALIZATION</b>	3D AND BIM SURVEY - Corso: INGEGNERIA DEI SISTEMI EDILIZI 3D AND BIM SURVEY - Corso: BUILDING ENGINEERING		
<b>YEAR</b>	2		
<b>TERM (SEMESTER)</b>	2° semester		
<b>ATTENDANCE</b>	Not mandatory		
<b>EVALUATION</b>	Out of 30		
<b>TEACHER OFFICE HOURS</b>	<p><b>LO BRUTTO MAURO</b> 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.</p> <p><b>MASNATA CHIARA</b> Monday 12:00 13:00</p>		

**MODULE  
MONITORING AND BIM**

*Prof. MAURO LO BRUTTO*

**SUGGESTED BIBLIOGRAPHY**

Materiale didattico fornito dal docente, dispense, articoli riviste

<b>AMBIT</b>	20558-A scelta dello studente
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<b>INDIVIDUAL STUDY (Hrs)</b>	98
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<b>COURSE ACTIVITY (Hrs)</b>	52
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**EDUCATIONAL OBJECTIVES OF THE MODULE**

The module is aimed to give information on the most important Geomatics techniques for the geometric analysis of buildings and structures. During the course, the laser scanner survey for the modelling of buildings in BIM environment will be discussed and in particular the Scan-to-BIM approach.

**SYLLABUS**

<b>Hrs</b>	<b>Frontal teaching</b>
7	General concepts of structural monitoring. Monitoring with topographic techniques. Main instruments for geometric monitoring. Robotic total stations.
7	General concepts on terrestrial photogrammetry and RPAS (Remote Piloted Aircraft Systems) photogrammetry. Applications of photogrammetry for the monitoring of structures.
7	Theoretical principles of the terrestrial laser scanner. Procedures for surveying. The terrestrial laser scanner for 3D modelling and monitoring.
7	Introduction to BIM concepts. The Scan-to-BIM approach for the management and maintenance of existing buildings.

  

<b>Hrs</b>	<b>Practice</b>
6	Instruments for geometric surveying. Total station survey.
6	Photogrammetry survey and processing.
6	Laser scanner survey acquisitions and processing.
6	Exercises on the Scan-to-BIM process. Case study presentation.

**MODULE  
EXPERIMENTAL DYNAMICS**

*Prof.ssa CHIARA MASNATA*

**SUGGESTED BIBLIOGRAPHY**

Vibration Monitoring, Testing, and Instrumentation  
 Edited by Clarence W. de Silva The University of British Columbia Vancouver, Canada Ltfi) CRC Press, Boca Raton London  
 New York CRC Press is an imprint of the Taylor & Francis Group, 2007  
 ISBN 9781420053197

<b>AMBIT</b>	20558-A scelta dello studente
<b>INDIVIDUAL STUDY (Hrs)</b>	98
<b>COURSE ACTIVITY (Hrs)</b>	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, and the analysis and design of structural control systems. In this context, basic knowledge related to the use of sensors suitable for structural monitoring will be provided, as well as the consequent acquisition, processing, and analysis of the recorded signals.  
 Several structural dynamic identification methods will be analyzed and implemented in Matlab environment. Further, various practical applications will also be carried out both with guided tours in the laboratory and on full-scale structures, with the aim of learning how to use the necessary devices for dynamics tests and structural monitoring procedures.

**SYLLABUS**

Hrs	Frontal teaching
3	Sampling and acquisition of signals
3	Basics of Signal analysis
2	Displacements and accelerations measurement devices. Tools for structural excitation: Shaker, shaking tables and impact hammers. Contact-less vibration measurements: single point contact, Laser Scanner Vibrometer, Radar Interferometer
4	Analysis of single and multi-degree of freedom dynamical systems in the time domain
4	Analysis of single and multi-degree of freedom dynamical systems in the frequency domain
4	Identification methods for single degree of freedom systems
4	Dynamics identification methods and monitoring for multi degree of freedom structures
4	Seismic base isolation and vibration control
Hrs	Practice
3	Experimental Vibration tests of single-degree-of-freedom systems in the Laboratory
2	Experimental devices and tests for structural control and Monitoring
3	Experimental Vibration tests of multi-degree-of-freedom systems in the Laboratory
4	Experimental modal analysis
4	Application of dynamic identification methods on multi-degree-of-freedom structures.
4	Experimental monitoring test with accelerometers and Interferometric Radar
4	Presentation of case studies of structural monitoring. Guided Skype visit in national and international experimental dynamics laboratory