# UNIVERSITÀ DEGLI STUDI DI PALERMO

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| **DEPARTMENT** | Ingegneria |
| **ACADEMIC YEAR** | 2019/2020 |
| **BACHELOR'S DEGREE (BSC)** | BUILDING ENGINEERING, INNOVATION AND RETROFITTING |
| **SUBJECT** | TOPOGRAPHIC SURVEY |
| **TYPE OF EDUCATIONAL ACTIVITY** | B |
| **AMBIT** | 50108-Edilizia e ambiente |
| **CODE** | 20404 |
| **SCIENTIFIC SECTOR(S)** | ICAR/06 |
| **HEAD PROFESSOR(S)** | LO BRUTTO MAURO Professore Associato Univ. di PALERMO |
| **OTHER PROFESSOR(S)** | |
| **CREDITS** | 9 |
| **INDIVIDUAL STUDY (Hrs)** | 144 |
| **COURSE ACTIVITY (Hrs)** | 81 |
| **PROPAEDEUTICAL SUBJECTS** | |
| **MUTUALIZATION** | |
| **YEAR** | 2 |
| **TERM (SEMESTER)** | 2° semester |
| **ATTENDANCE** | Not mandatory |
| **EVALUATION** | Out of 30 |
| **TEACHER OFFICE HOURS** | **LO BRUTTO MAURO**<br>Monday 09:00 12:00 Dipartimento di Ingegneria - Area Geomatica - viale delle Scienze - Edificio 8 - scala F6 - secondo piano.<br>Tuesday 09:00 12:00 Dipartimento di Ingegneria - Area Geomatica - viale delle Scienze - Edificio 8 - scala F6 - secondo piano. |

**DOCENTE:** Prof. MAURO LO BRUTTO

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| **PREREQUISITES** | Mathematical analysis, Geometry, Drawing and CAD Elements |
| **LEARNING OUTCOMES** | knowledge and understanding<br>The student will acquire mainly the knowledge about the techniques of topographic, photogrammetric and laser scanning survey of structures and infrastructures. The course will be directed towards the understanding of issues relating to the most modern instrumental techniques and their integration.<br><br>Applying knowledge and understanding<br>The student will be able to use their knowledge to solve problems concerning the building; this knowledge is indispensable in the skills of the graduate in Building Engineering, Innovation and Retrofitting.<br>The student will be able to evaluate the most suitable survey methods and to understand the possible professional applications of the acquired techniques. The student will also be able to assess the accuracy and reliability of the metric measurements.<br><br>Making judgements<br>The discipline gives a critical capability that allows you to evaluate the procedures and the methods necessary to develop the required works.<br><br>Communication skills<br>The student will acquire the ability to expose our process and to illustrate the methodology followed by presentations with power point, graphic tables, charts and graphs. Such skills could be acquired through the realization of a final work that summarizes and describes a practical experience carried out independently by the student.<br><br>Learning skills<br>The activities carried out during the course and the different techniques proposed will stimulate students to acquire:<br>- ability to update independently on the evolution of instrumentation and software for the survey<br>- ability to consult publications in scientific texts and journals. |
| **ASSESSMENT METHODS** | The exam consists of a discussion on the topics of the course.<br>The exam is aimed at ensuring the possession of the competencies and disciplinary knowledge provided by the course; in particular, it will evaluate the level of: knowledge of course content, ability to establish connections between the contents of the course, use of adequate technical language, ability to use the notions acquired in practical cases.<br>The evaluation, out of thirty, will be assessed on the basis of the student level. The student must demonstrate elementary knowledge of the course topics to pass the exam and to obtain a score of not less than 18/30.<br>The criteria for evaluation are as follows:<br>Grade: Excellent. Rating: 30-30 with distinction. Excellent knowledge of the topics and very good language skills. Good analytical skills. The student is able to use the knowledge he/she has acquired to solve problems.<br>Grade: Very good. Rating: 26-29. Good grasp of the topics. Sound language skills. The student is able to use the knowledge he/she has acquired to solve problems.<br>Grade: Good. Rating: 24-25. Basic knowledge of the main topics. Fair language skills with limited ability to independently use the knowledge acquired to solve problems.<br>Grade: Satisfactory 21-23. The student lacks a firm grasp but has some knowledge of the main topics. Satisfactory language skills. Low ability to independently use the knowledge acquired.<br>Grade: Sufficient 18-20.Minimum basic knowledge of the main topics and technical language. Very low ability to independently use the knowledge acquired.<br>Fail: The student does not have an acceptable knowledge of the topics. |
| **EDUCATIONAL OBJECTIVES** | The course of Topographic Survey aims to provide the knowledge to plan a survey project, to execute it and to produce deliverables useful for geometric analysis of buildings, for studies on the degradation or on the constructive characteristics, for monitoring of buildings.<br><br>The course aims to provide students with adequate cultural and professional training, to survey and to represent the building.<br><br>The main educational goal is the teaching of the project of the survey, intended not only as a compendium of metric operations but even more as a complex system of critical decisions related to finding investigation purposes.<br><br>In addition, the course is designed to make students aware of the possibilities and limits of modern methods for the acquisition of three-dimensional geometric data through the knowledge of the most modern techniques currently available. |

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| | The Laboratory of Photogrammetric survey of architecture has the objective to allow students the use and application of theoretical concepts and techniques acquired during the lectures. in real case studies.<br><br>The training program, developed in parallel to lectures, is completed with an acquisition of all the basics of topographical, photogrammetric and laser scanning equipment in order to get hold of modern methodological approaches. |
| **TEACHING METHODS** | Lectures, Practice, Laboratory |
| **SUGGESTED BIBLIOGRAPHY** | R. Barzaghi, L. Pinto, D. Pagliari. Elementi di topografia e trattamento delle osservazioni. Seconda edizione. CittaStudi Edizioni, 2018.<br>G. Guidi, M. Russo, J.A. Beraldin. Acquisizione 3D e modellazione poligonale. McGraw-Hill Companies, 2010.<br>T. Luhmann, S. Robson, S. Kyle, J. Boehn. Close-range photogrammetry and 3D imaging. 2nd edition, De Gruyter, 2013.<br>R. Cannarozzo, L. Cucchiarini, W. Meschieri. Misure Rilievo Progetto. Moduli di topografia per il triennio degli ITG. Vol. 2-3, Zanichelli Editore, 2007.<br>L. De Luca. La fotomodellazione architettonica. Rilievo, modellazione, rappresentazione di edifici a partire da fotografie. Dario Flaccovio Editore, 2010.<br>A. Selvini, F. Guzzetti. Fotogrammetria generale. UTET, Torino 2000.<br>R. Galetto, A. Spalla. Lezioni di topografia. CUSL, Pavia 1998.<br>K. Krauss (traduzione S. Dequal). Fotogrammetria – vol. 1 Teoria e Applicazioni. Libreria Universitaria Levrotto & Bella, Torino 1994.<br>G. Bezoari, C. Monti, A. Selvini. Misura e rappresentazione. Casa Editrice Ambrosiana, Milano 2001. |

## SYLLABUS

| Hrs | Frontal teaching |
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| 5 | Definition of measurement. Notes on the statistical treatment of measurement errors (Theory of errors) |
| 5 | Topographic survey. Topographic instruments and measurement operations (angles, distances and height differences) |
| 5 | Topographic survey. Planimetric topographic survey methods (traverse, topographic networks) |
| 5 | Topographic survey. Topographic survey methods for the height (Levelling) |
| 4 | Topographic survey. Topographic computations and traverse adjustment. |
| 5 | Laser scanner survey. Principles of laser scanner survey. Survey process. |
| 5 | Photogrammetric survey. Elements of analytical photogrammetry, collinearity equation |
| 5 | Photogrammetric survey. Photogrammetric project, photogrammetric cameras, camera calibration |
| 5 | Photogrammetric survey. Images orientation. Bundle block-adjustment. |
| 5 | Image orientation. Digital photogrammetry, automatic procedures. Rectified and orthorectified imagery |

| Hrs | Practice |
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| 4 | Topographic survey. |
| 2 | Theory of errors |
| 4 | 3D photogrammetric survey |
| 2 | Terrestrial laser scanner survey |

| Hrs | Workshops |
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| 10 | Photogrammetric survey |
| 2 | Laser scanner survey. |
| 8 | Topographic survey. |