UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	CIVIL ENGINEERING
SUBJECT	SUSTAINABLE TRANSPORT INFRASTRUCTURE
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	20558-A scelta dello studente
CODE	22241
SCIENTIFIC SECTOR(S)	ICAR/04
HEAD PROFESSOR(S)	LO PRESTI DAVIDE Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LO PRESTI DAVIDE** Tuesday 12:00 13:00 Ufficio Docente - Laboratori Infrastrutture Viarie, Edificio 8, Dipartimento di Ingegneria

DOCENTE: Prof. DAVIDE LO PRESTI

PREREQUISITES	No prerequisite is mandatory; however, students should have already acquired basic knowledge and skills in road design and transport engineering.
LEARNING OUTCOMES	Knowledge and understanding: the student, at the end of the course, will be able to: i. Understand the importance of road infrastructures in the social and economic development of a country and some solutions to engineer more sustainable infrastructures ii. Define the concept of sustainable development and know how to decline it to civil engineering and road infrastructures iii. Recognize and apply the basic methodologies for the "Sustainability Assessment" of road infrastructures, including computation techniques based on "Life Cycle Thinking" iv. Knowing the "SMART" solutions to implement sustainability in the production, construction, use and end-of-life phases of road infrastructures v. produce effective presentations of project results by gaining teamwork experience Ability to apply knowledge and understanding: the student will be able to apply the knowledge and methodologies acquired during the course both to combine sustainability assessment with technological development and to include it in the life cycle management of road infrastructures. Furthermore, the student is expected to be able to devise multi-disciplinary solutions that stimulate him to extend his skills to other sectors and / or understand the opportunities for improvement in civil engineering Communication skills: the student will acquire the ability to illustrate issues related to the course contents with competence and properties of language, even in specialized contexts. In addition, there will be lessons and exercises organized to improve exhibition and public speaking skills Learning skills: the student will be able to independently address the issues relating to the sustainability of road infrastructures but the course is also structured to provide learning moments using innovative teaching techniques (i.e. project-based learning)
ASSESSMENT METHODS	Oral exam. The presentation and discussion of the design themes assigned during the course is also provided. Evaluation criteria: •Before the exams, the student must deliver the final versions of the exercises (including group) with related drawings, reports and / or presentations •The student will have to answer at least 4 oral questions, on all the topics of the program, also with reference to the recommended texts. •The final test for each student, questioned individually, aims to assess whether he has knowledge and understanding of the topics and if he has acquired interpretative competence and autonomy of judgment with reference to the exercises (design themes) assigned during the course (see "organization of teaching"). •The student must be able to present to the examiner and discuss the topics related to the exercises with competence. The evaluation takes place in thirtieths; the range of grades of evaluation is between 18 and 30 cum laude, according to the following parameters: •Excellent (30 - 30 cum laude): Excellent knowledge of the topics, excellent language properties, good analytical and interpretative skills; the student is fully capable of applying the acquired knowledge and methods •Very good (26-29): Good command of subjects, full ownership of language; the student is able to apply the acquired knowledge and methods •Good (24-25): Basic knowledge of the main topics, good language properties; the student shows a limited ability to use the acquired knowledge and methods •Satisfactory (21-23): Basic knowledge of some topics, satisfactory language properties; poor ability to autonomously apply the acquired knowledge and methods •Sufficient (18-20): Minimum knowledge of some topics related to the sustainability of road infrastructures; very little or no ability to autonomously apply the acquired knowledge and methods •Insufficient: The student does not have an acceptable knowledge of the topics covered in the course

EDUCATIONAL OBJECTIVES	The objectives of the course are many, however the following three trends can be identified: 1.Stimulate the training of a multidisciplinary infrastructure engineer in nature, who can grow during the course through: the presentation of techniques and methods not typical for the civil engineering, together with the direct contamination with students and/or professionals with different backgrounds. 2.Provide the basic knowledge necessary for students, of civil engineering and beyond, to understand and define the philosophy of sustainable development, together with the techniques used to measure the sustainability of projects and practices of technological development and infrastructure management. 3.Understand multi-disciplinary “SMART” solutions to conceive more sustainable transport infrastructures.
TEACHING METHODS	In order to optimize the understanding of the covered topics, the teacher’s lectures by will be accompanied by worshops focused on real cases together with lectures and / or specialist technical visits shared with experts and / or professionals of the sector. The course is therefore a mixture of: 1) Frontal lessons; 2) Classroom exercises by the teacher; 3) Practical exercises assigned to the student to be carried out in groups and/or independently 4) Specialized seminars and possible technical visits Students will be encouraged to work in groups. Furthermore, in order to improve communication skills, during the course there will be moments dedicated to the presentation of the results of the design laboratory work.
SUGGESTED BIBLIOGRAPHY	•Selected scientific bibliography will be given by the teacher •Teacher handouts and Lecture notes Testi consigliati per gli approfondimenti: •Butera F., 2021. Affrontare la complessità. Per governare la transizione ecologica, Edizioni Ambiente •Dell’Acqua G., 2018. Il Building Information Modeling per le grandi opere lineari, EPC editore

SYLLABUS

Hrs	Frontal teaching
6	Introduction to the course and Sustainable transport Infrastructure
16	SUSTAINABILITY AND CIVIL ENGINEERING Sustainable developments: philosophy and definitions Measuring Sustainability: •Standards and Sustainability assessment •Sustainability Rating Systems •Life cycle techniques: Life cycle assessment (LCA), Life cycle costing (LCC), social life cycle assessment (SLCA), life cycle sustainability assessment (LCSA) •Multi-Criteria decison making Life-cycle based technology development and life cycle management
10	MULTI-DISCIPLINARY “SMART” SOLUTIONS FOR SUSTAINABLE TRANSPORT INFRASTRUCTURE •Sustainable and Safe Infrastructure •Multi-functional Infrastructure •Automated Infrastructure •Resilient Infrastructure •Transition-ready Infrastructure: -Electrification -Connected, Cooperative and Autonomous Mobility -Digitalisation, BIM e Digital twins Seminars and/or technical visits

SYLLABUS

Hrs	Frontal teaching
4	SUSTI - SEMINARS and/or TECHNICAL VISITS: lectures held by the teacher and industry professionals and colleagues from other universities or trade associations (in English and / or Italian). The topics will be defined during the course based on the events and the availability of specialists. Possible topics are the following: - The Road Infrastructures of the future - The financing possibilities for road infrastructures - BIM for Linear Infrastructures - Road and / or airport safety - Connected, Cooperative and Automated mobility - Innovation in planning, design and manageemnt of transport infrastructure - Communication skills for engineers

Hrs	Practice
3	Sustainability Assessment of a civil engineering project

Hrs	Workshops
15	Laboratory of Sustainability Assessment in civil engineering (group project with final presentation)