UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	SAFETY ENGINEERING
SUBJECT	INFRASTRUCTURES FOR MOBILITY AND TRANSPORTATION
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10657-Attività formative affini o integrative
CODE	03956
SCIENTIFIC SECTOR(S)	ICAR/04
HEAD PROFESSOR(S)	GRANA' ANNA Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**GRANA' ANNA** Monday 11:00 12:30 ufficio del docente, su appuntamento Tuesday 12:00 13:00 ufficio del docente, su appuntamento Thursday 12:00 13:00 ufficio del docente, su appuntamento

DOCENTE: Prof.ssa ANNA GRANA'

PREREQUISITES	No prerequisite is required; however, it is appropriate that the students have already acquired basic knowledge of mathematics, physical geography and geomatics.
LEARNING OUTCOMES	Knowledge and Comprehension Abilities: The course is aimed at a first cognitive approach of the topics of planning, design, construction and operation and safety management of the transportation infrastructures and their territorial and environmental importance. This goal is achieved by attending lectures, library researches and seminars. The educational tools used for this goal are Power Point presentations, along with handbooks and manuals on the Transportation Infrastructures. Ability to Apply Knowledge and Comprehension: The teaching activities provide students with opportunities to deepen their learning and understanding of issues related to safety of mobility and transportation infrastructures, with regard to the processes of balance and transformation of the territory characterized by urban and metropolitan settlements, addressing various topics related to planning and design of the infrastructures in areas characterized by high density of land use and high transport demand. The following activities will help the students to apply their knowledge: classroom exercises, seminars, individual or group exercises. The educational tools used to achieve these goals include using computer-aided design software, basic maps and cartograms. Judgement Autonomy: Students will acquire an autonomous capability of judgment that enable them to make, in a conscious way, evaluations of the potential and critical issues of the transport infrastructure system in order to identify possible structural and functional solutions in terms of transportation safety. The students will be invited to study and acquire the best practices (active listening and participation), as well as team working skills. The educational tools include preparation of documents of the road geometric design and the textual report linked to the project exercise. Each student is invited, both individually and in group, to express his/her own personal opinions on the road geometric design he/she has studied and developed. Communication Abilities: Students will be able to present and communicate effectively the results of their work (analysis of the local contexts, determination of transport demand, identification and description of possible solutions in terms of transportation safety). The students will discuss these topics through oral presentations, graphical representations and written texts. The educational tools include using maps and computer-aided design software. Learning Abilities: Students will be able, using the learned methodologies, to identify solutions for the accessibility in the contexts of study and to define the technical and economic characteristics of the transportation infrastructures. The acquisition of these abilities will be tested through ongoing evaluations. The educational tools used for this goal can include handbooks and manuals, as well as Power Point presentations.
ASSESSMENT METHODS	Presentation of the documents of the geometric road design and oral examination on the topics of the course. Evaluation criteria: The student must answer at least four oral questions on all topics of the program, with reference to the recommended texts. The final evaluation for each student (each questioned) aims at appraising whether he/ she possesses a good knowledge and understanding of the topics and whether he/she has acquired interpretative expertise and autonomous assessments with reference to the concrete case of road design (see "Teaching methods"), assigned during the course and also developed in group (a maximum 5 students by group). The pass mark will be reached if the student will demonstrate knowledge and understanding (at least in general terms) of the topics specified in the program (and explained during the teaching activities) and the student will have minimal application skills in order to solve the case study assigned during the course and discussed during the exam. The student must be able to present to the examiner and discuss with competence the issues related for example to: - classification of transportation infrastructures, classification of road networks, geometric and functional classification of streets, highways and intersections, road design based on traffic demand, driver behavior and road safety; - road design standards and design policies, design criteria for the horizontal alignment and the vertical alignment for roads and cross sections; geometric design and safety issues of roads and road intersections (at grade intersections, interchanges, and roundabouts) in urban and extra-urban environment; - airport geography (air side and land side), characterization of runways, taxiways and apron, and airport infrastructures, airport safety and security,

	terminal; - design of railways, horizontal and vertical alignment and geometric design of track sections and railway stations. Below this threshold, the student will not be able to pass the examination. On the contrary, the more the student will be able to interact with the examiner and discuss the topics, and the more he/she will prove to have acquired in-depth knowledge and practical skills on the topics of the Course, the higher the evaluation grade will rise towards the top marks. The range of evaluation grade is comprised between 18 and 30 cum laude, according to the following criteria: Excellent (30 – 30 e lode): Excellent knowledge of the subjects studied in the course, excellent language skills, good analytical and interpretative capacity; the student is fully able to apply knowledge and methods learnt for the geometric design of roads and intersections, and design of airports, railways and railway stations. Very good (26-29): Good mastery of the subjects studied in the course, very good language skills; the student is able to apply knowledge and methods learnt for the geometric design of roads and intersections, and design of airports, railways and railway stations. Good (24-25): Knowledge of the main subjects studied in the course, good language skills; the student shows a limited ability to apply knowledge and methods learnt for the geometric design of roads and intersections, and design of airports, railways and railway stations. Average (21-23): Basic knowledge of some subjects studied in the course, adequate language skills; poor ability to autonomously apply knowledge and methods learnt for the geometric design of roads and intersections, and design of airports, railways and railway stations. Pass (18-20): Minimal knowledge of some geographic subjects and the technical language; very poor or inexistent ability to autonomously apply knowledge and methods learnt for the geometric design of roads and intersections, and design of airports, railways and railway stations. Fail: The student does not have an acceptable knowledge of the subjects studied during the teaching activities.
EDUCATIONAL OBJECTIVES	Bearing in mind the specific educational objectives of the Degree Course, the course introduces students to the issues related to planning, design, insertion of the transportation infrastructures into the natural and built environment. This course deals with the issues related to transportation infrastructure design and its insertion into the urban architecture and the territory, in relation to accessibility of the areas, the density of (existing and/or planned) infrastructure networks and road safety; the course provides the basic tools for the geometric and functional design of the roads and intersections in urban and extra-urban area and for the evaluation of environmental and safety impact of the design activities and operations at the different spatial scales, as well as appropriate knowledge for the design of airports and railways. In order to improve understanding of the topics covered in classroom, many exercises dedicated to the most frequent design applications in the professional field will be also carried out in classroom. A specific exercise will be assigned to the students in order to draw up some documents of the road geometric design to be developed autonomously and to discuss at the final examination. After completing this course, the student will know how to properly frame the issue of the road design as part of urban and regional planning, also as a consequence of other curricular subjects, and will be able to recognize and analyse problems characterizing the geometric design and safety of roads and intersections, railway and airports, as well as to provide sustainable design solutions in view of the working contexts within which he/she will be able to operate.
TEACHING METHODS	Classroom lectures, classroom exercises, seminars, exercises for drawing up some documents of the road geometric design.
SUGGESTED BIBLIOGRAPHY	- Appunti alle lezioni (Writing lessons) - F.A. Santagata (a cura di), AAVV. Strade. Pearson, 2016. - A. Benedetto. Strade, ferrovie Aeroporti. UTET, 2015. - F. Corriere, Infrastrutture viarie lineari ed intersezioni, Aracne Editrice, Roma 2008. - F. Corriere, Impianti ettometrici ed infrastrutture puntuali per i trasporti, Franco Angeli, Milano 2011. - Norme funzionali e geometriche per la costruzione delle strade (D.M. 5-11-2001). - Norme funzionali e geometriche per la costruzione delle intersezioni stradali (D.M. 19-4-2006). Per gli approfondimenti (For further study): - G. Tesoriere, Strade ferrovie aeroporti, UTET, Torino. - P. Ferrari, F. Giannini, Geometria e progetto di strade, ISEDI, Torino. - T. Esposito, R. Mauro, Fondamenti di infrastrutture viarie Vol. 1: La geometria stradale, Hevelius, Benevento. - Mannering F.L., Washburn S.S. Principles of Highway Engineering and Traffic Analysis, 5th ed. John Wiley & Sons, 2013. USA

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the transport infrastructures. Evolution of the transport infrastructures with reference to the territorial transformation processes. Classification of transportation infrastructures: land transport, air transport, maritime transport, mixed and special transport.
2	Classification of Streets and Highways and design policies: geometric and functional classification, level of service, design speed. The basic stages in the road development process. Road design standards.
4	Road safety; crash phenomenon; definition and measure of road safety; objective and subjective safety in traffic; proactive and reactive risk assessment; Safety Performance Functions; goodness-of-fit in safety estimation; Empirical Bayes methods; crash modifications factors; restraining device.
2	Road design based on traffic demand
4	Design criteria for the horizontal alignment and the vertical alignment for roads and railways. Best practices and guidelines
6	The road design: design and calculate the horizontal alignment and the vertical profile of a roadway centreline; design and calculate the combined horizontal and vertical alignment of a roadway centreline, cross sections and metric computation
6	Road junctions and intersections: at-grade intersections, modern roundabouts, and interchanges. National and internationals standards and guidelines
4	Urban roads and streets. Traffic calming. Introduction to surface public transport and rapid transit systems
4	Airport planning and management: land side, air side, terminal. Maritime infrastructures.
2	Airport safety and security
4	Railways and railway stations

Hrs	Practice
14	Based on road geometric standards, exercises for drawing up some documents of the geometric road design (textual report, horizontal alignment and vertical profile, cross sections), also by using computer-aided design software; for the last activity, a temporary license will be given to the students.