



COURSE: Materials for Roads, Railways and Airports included in: <i>Materials for Roads, Railways and Airports + Design of Roads, Railways and Airports</i> (12ETCS)			
ACADEMIC YEAR: 2019-2020			
TYPE OF EDUCATIONAL ACTIVITY: (B) Characterizing			
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Language: Italian			
ECTS: 9	hours: 81 of which: - n.48 Lessons - n.33 Tutorials/Practice	Campus: Potenza School of Engineering Program: Master's degree in Civil Engineering (LM23)	Semester: Annual

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Acquire the theories and techniques aimed at construction and testing of transportation infrastructure through the study of traditional and innovative materials subjected to the stresses induced by dynamic loads. Tackle the problems relating to stability and computational analysis, both static and dynamic, of the road structures and pavements.

The main knowledge provided are:

- Construction of the road and rail structure;
- Materials for the construction of transportation infrastructure (aggregates, bituminous binders, mixtures used in road superstructures);
- Typologies and characteristics of road and airport pavements.

The main skills transferred are:

- Theoretical and experimental study of the materials used on roads construction;
- Design and the experimental verification of the road structure;
- Design of road pavements;
- Quality control;
- Use of methodology and calculation codes.

In the specific teaching contributes to the following learning outcomes:

- *Knowledge and ability of comprehension*: the student must demonstrate of knowing and being able to understand the problems relative to the design, building, maintaining and test of road and railway embankments.
- *Ability to apply knowledge and comprehension*: the student must demonstrate that he is able to use the theoretical tools acquired to solve engineering problems with particular reference to the road infrastructures.
- *Autonomy of judgment*: the student must be able to deepen in an independent way what he has learned. It must develop an appropriate synthesis capacity and must be able to solve specific problems in the fields of road and railway infrastructures.
- *Communication ability*: the student must be able to communicate and explain clearly the acquired knowledge, even to people who are not experts. It must also be able to use the technical-scientific language properly. The correct, clear and concise expression, therefore, constitutes an element of primary judgment.
- *Learning Ability*: The student must progressively become independent from the teacher. It must be able to update itself by consulting scientific texts and publications.

PRE-REQUIREMENTS

It's suggested to pass previously the exam of "*Basics of Roads, Railways and Airports*"



SYLLABUS

The construction of the road solid. Road geotechnics: soils property, soils classification, basic parameters of loose soils, soil compaction, subgrade bearing capacity, soil stabilization. The calculation of the soil volume in road the construction. Aggregates: classification aggregates, origin of aggregates, production of aggregates, properties of aggregates, geometrical requirements, physical requirements, mechanical requirements, durability requirements, chemical requirements and affinity with the bitumen. Bituminous binders: bitumen production, bitumen chemistry, structural models of the bitumen, conventional tests on bitumen, nomogram of Van der Poel, Heukelom diagrams, classification of bitumens, polymer modified bitumen PMB, emulsions. Bitumen rheology and SHRP research program. Pavements: types (Flexible CFS, Full depth FDS semirigid SRS, inverted IS, rigid JPCP, rigid CRCP), structural function and stiffness, layers, functions and materials, pathologies. CE marking of asphalt concrete. Traditional and volumetric mix design of asphalt concretes: prescriptive and performance methods, the mixture of aggregates, volumetric analysis of asphalt concrete, maximum density curve, mix design of road mixtures. Contract specifications. Mechanical characterization of asphalt concretes: stiffness and complex modulus, fatigue resistance, resistance to temperature variations, indirect tensile test, Cantabro test, UNIBAS-MPT test. Cement stabilized mixture, unbounded mixtures. Production, installation and quality control of asphalt concretes. Surface texture of pavements. Special asphalt: porous asphalt, twin Layer, SMA, high modulus asphalt, grouted macadam, lightened asphalts with expanded clay, warm mix asphalt, asphalt rubber, glassasphalt, cold surface treatments, photocatalytic pavements, composite polyfunctional pavement. The recycling of asphalt concretes. Pavements design: catalogs design, semiempirical methods, rational methods. Stress and strain analysis: fatigue damage and rut depth. Mechanistic-Empirical Pavement Design (ME-PDG). Rational methods of design of rigid pavements. Estimated calculation of road works.

TEACHING METHODS

The didactic organization provides for 81 total hours of which 48 hours of lecture and 33 of practice. The course requests the completion of the technical project that began in the course of "*Basics of Roads, Railways and Airports*" about the project of a short road. This exercise will be developed in groups of three students. The course also requires the preparation of a series of numerical exercises about the topics developed during the lessons (materials, laboratory tests, design of road pavements, etc.).

EVALUATION METHODS

Oral examination during which to ensure the knowledge and skills of the candidate. The questions are designed to check the clear understanding, by the candidate, of the phenomena and of the quantitative tools available to conduct the necessary analysis. The positive evaluation of guided exercises developed during the course represents a prerequisite to access to the oral examination. The overall evaluation will take into account the level of maturity reached in the exercises.



TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- NIKOLAIDES A., Highway Engineering - Pavements, Materials and Control of Quality, 2014, CRC Press Taylor & Francis Group.
- O'FLAHERTY, Highways - the location design construction and maintenance of road pavements, 2002, Fourth edition, Butterworth-Heinemann Elsevier.
- YANG H. HUANG, Pavement Analysis and Design, 2nd editions, 2004, Pearson Prentice Hall.
- YODER E J AND WITCZAK M W, Principles of pavement design, second edition, 1975, John Wiley & sons Inc.
- P. FERRARI, F. GIANNINI - Ingegneria Stradale - Vol. 2 – ISEDI, 1998.
- G. TESORIERE: Strade Ferrovie Aeroporti Vol. 2 – UTET, 1993.
- M. AGOSTINACCHIO, D. CIAMPA, S. OLITA, 2010. Strade ferrovie aeroporti – La progettazione geometrica in sicurezza, III Edizione, EPC libri, ISBN 978-88-6310-223-9.
- M. AGOSTINACCHIO, D. CIAMPA, S. OLITA, 2012. Movimento terra e macchine per lavori stradali – Problematiche, metodologie e soluzioni operative, EPC s.r.l., ISBN 978-88-6310-387-8.
- M. AGOSTINACCHIO, D. CIAMPA, S. OLITA, 2011. La progettazione delle strade – Guida alla corretta applicazione dei Decreti Ministeriali 5/11/2001, 22/04/04 e 19/04/06, II Edizione, EPC libri, ISBN 978-88-6310-326-7.
- Educational material online at URL: <https://sites.google.com/view/olita/home>
- Course notes provided by the professor and available in electronic format.

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, program and verification methods, the teacher describes instruments and method of didactic material sharing (google drive shared folders, website, Telegram, etc.). At the same time collects the list of students who wish to enroll in the course.

Reception hours: Tuesday from 9.30 to 11.30 at his own studio: School of Engineering (IV floor, room 56). In addition to the reception hours weekly, the teacher is always available immediately after each lesson and for urgent matters through its institutional e-mail.

EXAMINATION SESSIONS (FORECAST)¹

12/02/2020, 11/03/2020, 10/04/2020, 15/05/2020, 13/06/2020, 17/07/2020, 16/09/2020, 14/10/2020, 18/11/2020, 16/12/2020.

SEMINARS BY EXTERNAL EXPERTS YES NO

FURTHER INFORMATION

The attendance of didactic activities is automatically satisfied at the end of the semester in which they are located.

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.