SCUOLA DI SCIENZE AGRARIE, FORESTALI, ALIMENTARI ED AMBIENTALI

COURSE: **Constructions and planning of forest systems**			
ACADEMIC YEAR: **2021-2022**			
TYPE OF EDUCATIONAL ACTIVITY: **Course Characterizing the Master Degree Curricula on: "Forestry and Environmental Sciences"**			
TEACHER: **Prof. Pietro PICUNO**			
e-mail: **pietro.picuno@unibas.it**	web: **http://docenti.unibas.it/site/home/docente.html?m=000198**		
phone: **+39 0971 20.5437**	mobile (optional): **+39 329 3606235**		
Language: **Italian**			
ECTS: **n.5 ECTS lessons + n.1 ECTS practical training**	n. of hours: **n.40 hours lessons + n. 16 hours practical training**	Campus: **Potenza** - **SAFE School** Program: **Forestry and Environmental Science**	Semester: **1st**

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

This Course introduces into issues related to forestry construction and their relationship with the surrounding natural space and, in particular, with the territory, the environment and the forest landscape. At the end of the course, students will be able to properly report the acquired knowledge and apply it by solving simple problems - even numerical, where appropriate - or discussing elementary cases on issues related to forestry constructions and their relationship with rural land.

The aim of the course is to provide the student with the ***skills*** related to the design and implementation of forestry constructions, as well as computer graphics and geomatics, necessary for the survey and representation of buildings and the surrounding area, as a basis for planning the forestry systems**.**

- **Knowledge and understanding**: knowledge and ability to understand the general principles of the different architectural and building solutions for forestry construction, plant typologies for microclimate control and main elements for the microclimatic control of the confined environment through the use of electronic systems, methods for surveying and representing the built environment, tools for the analysis, planning and management of forest systems, with particular attention to ICT tools, such as the Geographical Information Systems - GIS.
- **Applying Knowledge and understanding**: Ability to apply the general principles of the different design choices about architectural and constructive solutions for forestry construction, to adopt the best plant design choices for microclimatic control and to correctly use electronic regulation devices in the confined environment, as well as tools for the analysis, planning and management of forest systems through the use of GIS.
- **Making judgements**: Ability to critically evaluate the different properties of materials used as building components, as well as architectural solutions; ability to evaluate and apply the most suitable solutions for microclimate control; ability to identify the characteristics of each type of plant; identify and represent building relationships with the surrounding landscape as the basis for planning forestry systems.
- **Communication skills**: Ability to communicate the acquired information, organize them in a logical way, using a correct language, using relevant mathematical and graphical means where needed.
- **Learning skills**: ability to collect and organize information received during the lesson hours or on the recommended texts, available literature and within the *Web*.

PRE-REQUIREMENTS

The student should have successfully passed the following prerequisites courses:

- Mathematics (concept of derivate and integral and their use for calculation);
- Physics (concepts from statics, thermo-dynamics and optics);
- Survey, drawing and GIS (topographical/GPS survey, CAD (Computer Aided Design), fundamentals about GIS).

SYLLABUS

Chapter 1: Design and implementation of a forestry building (16 hours of theoretical lesson)

Structural schemes: brick masonry and frame buildings. Structural building components: beams, pillars, slabs, foundations. Construction materials: reinforced concrete, steel, wood, plastic. Reinforced concrete construction techniques. Characterization tests of building materials. Building finishes: walls, windows/doors, technical plants, floors and coatings. Principles of statics: isostatic beams, constrained reactions, stress characteristics.

Chapter 2: Monitoring and climate control of an agricultural-forestry building (16 hours of theoretical lesson)

Welfare conditions for humans, animals, and plants. Principles of sensible heat transfer: transmission by conduction, convection and radiation. Control of low temperatures: heating systems. Control of high temperatures: shading,

ventilation, cooling, air conditioning and climate control. Principles of psychrometry. The *Mollier* diagram. Ventilation and fog/cooling systems. Gas and dust control.

Chapter 3: Design and implementation of public and private works (8 hours of lesson)

Drafting of the project: technical report, graphical drawings, administrative documents. Direction of Works: construction site documents. SAL (Work Progress Reports). Technical-administrative final tests of a work. Static testing of a structure.

Chapter 4: Elements of rural constructions (8 hours of in Laboratory practical training)

Cattle and buffalo housing: Classification of barns. Sizing and construction characteristics of stables. Sizing and construction methods of manure disposal systems. Organizational criteria and sizing of free stables. Planimetric schemes. Construction characteristics of areas, milking parlors and ancillary rooms. Shelters for pigs: General organization of pig breeding. Classification of pigsties. Types of farrowing stalls and their dimensions. Organization of pigsties. Types of flooring. Manure management. Shelters for sheep and goats: General information on the organization of livestock farming; size and construction characteristics of sheepfolds. Shelters for chicken/rabbit: general organization of the breeding; dimensioning and constructive characteristics of the poultry houses and buildings for rabbits. Greenhouses and tunnels. Support structures and covering materials: glass and plastic materials. Mechanical and spectro-radiometric characteristics of roofing materials. Technical plants for crop protection. Design of a rural construction through CAD techniques.

Chapter 5: Planning forest systems (8 hours of in Laboratory practical training)

Principles and use of a Geographic Information System for planning agricultural/forestry systems. Georeferencing spatial data. Numerical Elevation Models: MESH, TIN and GRID. LIDAR (*Light Detection And Ranging*). Applications in planning and management of protected areas, energy systems, agricultural and forest landscape, agricultural activities and *Smart Communities*. Methodologies and Applications of Forest Photointerpretation. Methodologies and Applications for Road, Forest and Agricultural Constructions. Agricultural paths and sheep-tracks. Forest trails.

TEACHING METHODS

The course includes n. 56 hours of teaching, divided into theoretical lessons (40 hours of lectures) and training practice (16 hours of guided exercises in the laboratory). More in detail, the course is organized in 16 hours of classes for each one of the first two chapters above reported, 8 hours for chapter n.3 and 16 hours of practical training and project in the laboratory of Survey, Drawing and GIS of the SAFE School, for the remaining two chapters.

EVALUATION METHODS

The final exam is aimed to ascertain the level of achievement of the knowledge and skills acquired by the student. It takes place in one session in the presence of the Board of Examiners. The examination is ordinarily conducted on the following phases:

a) Presentation by the student of his/her own annual project personally prepared (individually or in groups);

b) at the discretion of the Commission, some questions are asked on the five sections comprising the course.

c) a final general discussion about the use of advanced technologies for the analysis, planning and management of forest systems completes the examination.

The final vote is the average of the votes cast by each member of the Commission, unit-rounded. If there is unanimous judgment by the members of the Commission, a "*cum Laude*" acknowledgement may be allowed.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Textbooks:

- R. Chiumenti. "*Costruzioni Rurali*". Edagricole, Bologna. (in Italian)
- A. Biasini, R. Galetto, P. Mussio, P. Rigamonti: "*La cartografia e i sistemi informativi per il governo del territorio*". Franco Angeli, Milano. (in Italian)
- N. Dainelli, F. Bonechi, M. Spagnolo, A. Canessa "*Cartografia numerica - Manuale pratico per l'utilizzo dei GIS*". Dario Flaccovio Editore. (in Italian)
- Introduction to Biosystems Engineering – Chapter on: "Plant Production in Controlled Environments", freely available at: https://vtechworks.lib.vt.edu/handle/10919/93254
- Introduction to Biosystems Engineering – Chapter on: "Building Design for Energy Efficient Livestock Housing", freely available at: https://vtechworks.lib.vt.edu/handle/10919/93254
- More documents are available on-line on the Teacher's *website: http://docenti.unibas.it/site/home/docente/materiali-e-risorse.html?m=000198*

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the general objectives, program and methods of exam, the teacher informs the students about the recommended educational material and related retrieval mode. Simultaneously, it is collected a list of students that decide to participate into the practical training exercises of the course, together with their name, badge number and email.

Office hours: each Wednesday, from 11:30 to 13:30 am at the Professor's Office – SAFE School. In addition to this weekly reception, the teacher is available by appointment, to be fixed by direct contact with the student through e-mail or phone.

EXAMINATION SESSIONS (FORECAST)[1]

16/02/2022, 16/03/2022, 13/04/2022, 11/05/2022, 15/06/2022, 13/07/2022, 14/09/2022 12/10/2022, 16/11/2022, 14/12/2022

EVALUATION BOARD

Prof. Pietro PICUNO, dr. Alfonso TORTORA, Ing. Dina STATUTO

SEMINARS BY EXTERNAL EXPERTS YES **X** NO □

FURTHER INFORMATION

Course Code: FAM/0514

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