UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Environmental Acoustics

2223-2-F7501Q072

Aims

The aims of the course are to provide the tools to address the problems of environmental acoustics in its various and to use the soundscape as an environmental indicator . The first lessons will illustrate the theoretical foundations of acoustics, thanks to which, later, it will be easy to describe and understand the phenomena concerning noise and soundscape. In particular, the student will be able to characterize the main sources of noise and how they influence the environment and human health. The course will also let you know which are the main regulations of the sector (regional, national, European) and how these must be applied. Much space will be given to the analysis of real cases, even complex ones, and in the laboratory hours the notions acquired during the frontal lessons will be applied to simple real cases. During the laboratory it will be possible to learn to use measuring instruments and software that meet the requirements of current regulations for carrying out environmental assessments in the field of noise pollution. As regards the soundscape measurements, after having obtained and analyzed the main bio-acoustic indicators, the investigated sites will be evaluated from the point of view of environmental quality.

Contents

- Fundamental of Sound Waves, Main parameters. Bio-acoustic indicators. Equipments

- Sources of noise (road, railway, air port traffic, port, particular noise sources, antropic noise, biophonies)

- Propagation and Transmission of Air-borne Sound (air, ground attenuation, thermal gradient, atmospheric events, obstacles)

- Noise Reduction (at the source, barriers, special asphalt); noise reduction at parks, reserves, school and hospitals

- Outlines of Regulations and Laws

-Evaluation of Environmental Impact. Acoustics Classification. Action plan

- Computer simulation and Acoustic Models

- Use of bio-acoustic indicators for environmental quality assessment

- Room Acoustics (measurements, isolation, impact, vibration)

Detailed program

Introduction

- Notion of the physical basis of acoustics (the acoustic waves: speed, energy, propagation, reflection, diffraction, absorption).

- Acoustic parameters to evaluate the noise pollution (weighted sound levels, acoustical bands, SPL, LeqA,T, SEL, Lden, Lnight). Spectral analysis and FFT. Bio-acoustic indicators.

- Criteria for community noise

-Equipments and techniques (microphone, sound level meter, spectra analyzer, calibrator, software).

Environmental Acoustic

- Characterization of noise sources in urban area (traffic noise, railway noise, airplane noise, ship traffic, industrial plans noise, anthropic noise).

- Outdoor sound propagation (wave divergence, air absorption, ground effect, wind and temperature gradients, thermocline, attenuation by barriers)

- Control and mitigation (basic strategy, determination of required reduction, organisation of noise control, example of noise control planning) .

Room acoustics and Sound insulation

- Sound field in a room (reverberation time, quality index, materials and construction)

- Measurement and evaluation of room acoustics

- Propagation and transmission of airborne sound

- Measurement and rating of airborne sound insulation

- Propagation and radiation of structure-borne sound

- Measurement and rating of impact sound insulation

Practical experiences in laboratory and outdoor. In particular, the noise impact of a disturbing source will be evaluated, soundscape measurements will be carried out and the acoustic insulation indices of a building will be measured.

Prerequisites

Good knowledge of general physics and early mathematics.

Teaching form

- Lessons: 32 hours (4 credits)

- Laboratory experiences: 20 hours (2 credits)

Textbook and teaching resource

Didactic material provided by the teacher and available on UNIMIB elearning website.
Textbooks will also be recommended.

Semester

- first semester

Assessment method

The exam consists of an oral exam in which the topics presented in the lessons are discussed. In addition to learning the concepts presented in the course, students' skills and attitudes are also assessed to apply what has been learned in theory to simple applicative cases; the expositive ability and adequacy of the student's language is also assessed.

Office hours

Every day but during the teaching activities, After appointment to be taken via email: giovanni.zambon@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | SUSTAINABLE CITIES AND COMMUNITIES | LIFE BELOW WATER | LIFE ON LAND