Radar Rainfall Forecast, Early Warning Systems (250916)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	4.0 ECTS
Programs	MÀSTER UNIVERSITARI ERASMUS MUNDUS EN GESTIÓ DEL RISC D'INUNDACIÓ (pla 2024)
Course	2025/26

Main teaching language at each group

- Group 10Q1 English (Q1)

Faculty

Responsible Faculty: Daniel Sempere Torres
Faculty: Marc Berenguer Ferrer, Erika Roxana Melendez Landaverde, Daniel Sempere Torres

Objectives of Education

Motivation talks with emphasis on the radar data processing in order to highlight the necessity of an accurate correction of intrinsic measurement errors (beam blocking, ground clutters, attenuation...). Also, the methods for the interpolation of rainfall at the ground from the radar data volume will be described. In general, limitations of radar QPE will be exposed, as well as the advantages in the hydrological application, particularly in Flash Floods at medium-small basins. Some examples and case studies to illustrate the application to hydrological forecast will be presented, as well as the description of the current software and tools for the flood risk management. Demos and didactic interactive software (student-oriented) will be used in the practical session.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	36.0 h	100.00 %
	Medium group	0.0 h	0.00 %
	Laboratory classes	0.0 h	0.00 %
	Guided Activities	0.0 h	0.00 %
Self Study		64.0 h	

Contents

Introduction to Early Warning Systems.

Introduction to Early Warning Systems. Radar as observation instrument

Precipitation measurement using meteorological radars

Atmospheric processes generating precipitation. Precipitation Observation
Quantitative Estimation of Precipitation using meteorological radars (QPE)
Blending radar and raingauge estimates

Precipitation Forecasting and Nowcasting

Forecasting precipitation with meteorological models (NWP)
Radar Nowcasting. Application to the European radar network OPERA
Supervision of the course work. Analysis of the selected papers.

Early Warning Systems

02/11/22 From rainfall nowcasting to Impact-based Early Warnings.
The European Flood Awareness System (EFAS).
The European Flood Awareness System (EFAS). Case studies
Advanced site-specific warnings. Real-time Early Warning Services for emergency management and response
Presentations of the course works based on advanced journal papers

Teaching Methodology

The course consists of 1.6 hours per week of classroom activity (large size group) and 0.6 hours weekly with half the students (medium size group).

The 1.6 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0.6 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

Grading Rules

(*) The evaluation calendar and grading rules will be approved before the start of the course.

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

Bibliography

Basic

- Flash Flood Early Warning Systems. UCAR,
- Rinehart,Ronald E. Radar for Meteorologists. 5th ed. Columbia [Mo.]: Rinehart Publications, 2004. ISBN 0965800210.

- Weather Radar Fundamentals. UCAR,

Complementary

- Fabry, Frédéric. Radar Meteorology. Cambridge: Cambridge University Press, 2015, 2015. ISBN 9781107070462.