



Universitat de Lleida

GUIA DOCENT
**METEOROLOGIA APLICADA AL
MEDI AMBIENT**

Coordinació: CASTELLVI SENTIS, FRANCESC

Any acadèmic 2020-21

Informació general de l'assignatura

Denominació	METEOROLOGIA APLICADA AL MEDI AMBIENT			
Codi	102472			
Semestre d'impartició	2N Q(SEMESTRE) AVALUACIÓ CONTINUADA			
Caràcter	Grau/Màster	Curs	Caràcter	Modalitat
	Doble titulació: Grau en Enginyeria Forestal i Grau en Conservació de la Natura	4	OPTATIVA	Presencial
	Grau en Enginyeria Forestal	4	OPTATIVA	Presencial
Nombre de crèdits assignatura (ECTS)	6			
Tipus d'activitat, crèdits i grups	Tipus d'activitat	PRALAB	TEORIA	
	Nombre de crèdits	2.5	3.5	
	Nombre de grups	1	1	
Coordinació	CASTELLVI SENTIS, FRANCESC			
Departament/s	MEDI AMBIENT I CIÈNCIES DEL SÒL			
Distribució càrrega docent entre la classe presencial i el treball autònom de l'estudiant	1 h classe presencial = 0.5 h treball autònom			
Informació important sobre tractament de dades	Consulteu aquest enllaç per a més informació.			
Idioma/es d'impartició	English			
Distribució de crèdits	60% teoria i 40% en pràctiques de laboratori.			

Professor/a (s/es)	Adreça electrònica professor/a (s/es)	Crèdits impartits pel professorat	Horari de tutoria/lloc
CASTELLVI SENTIS, FRANCESC	francesc.castellvi@udl.cat	7,2	

Informació complementària de l'assignatura

The guide of this subject is available in English.

Possibility to invite a professors from other countries. It depends on the funding available.

The structural constrains derived by COVID- 19 may modify the objectives pursuit in the course.

Objectius acadèmics de l'assignatura

The course aims to achieve skills related to the analysis of climate data, climate simulation, and understanding of man processes involved in the soil - vegetation – atmosphere continuum within the surface boundary layer. The scope of the course are the study of processes of scalar exchange above the canopy top. Some global applications may analyzed within the framework of remote sensing.

Competències

1.- Organization of a large database. Analysis at different scales (spatial and temporal). Capability to take decisions.

2.- Capability to transfer knowledge.

3.- Capability to apply methods and techniques related with processes that can be observed above the canopy and within the atmospheric surface layer. Applications are aminly at local scale though some inside may be given at regional escale.

Continguts fonamentals de l'assignatura

1. Introduction. General concepts.

Warming up. Meteorology and climate. Micrometeorology and microclimate. Global warming and climate change. Terminology.

2. The database and the metadata. Weather generators.

The meteorological network in Catalonia. Free available databases. Quality control of climate time series. Extraterrestrial solar radiation. Estimation of the global solar radiation, R_s , the net radiation, R_n , and the soil heat flux, G . Generation of daily precipitation, maximum and minimum air temperatures, and solar radiation. Processes of downscaling to simulate R_s , R_n and G .

3. The atmosphere. General and local circulation. Boundary layers.

Thermodynamics of the air. Determination, estimation and measurement of weather variables. Katabatic and anabatic winds, and breezes. Föhn effect. Oasis effect. Properties of the roughness, inertial and mixing sub-layers. The Ekman layer. Geostrophic winds. General circulation.

4. The soil – vegetation – atmospheric surface layer continuum. The surface energy balance.

The evapotranspiration, ET , as a link between micro-meteorology and hydrology. The potential ET , ETP , and the ET of reference, ET_r . Semi-empirical equations and procedures for estimating the ETP , the ET_r and the ET . Forest productivity.

The Soil heat flux. Instrumentation. The incoming and outgoing long and short wave radiation (the four radiative components). Instrumentation. Efficiency in using the components of the radiation. Temperature of the air and of the canopy elements.

Turbulence. Reynolds averaging. The Monin Obukhov Similarity Theory, MOST. Profiles of the horizontal wind speed, the air temperature and the humidity. Limitation of MOST. Measurement of the turbulence. Instrumentation. The Eddy Covariance method. Measurement and estimation of the sensible heat flux, the latent heat flux and carbon dioxide flux using time series of scalars measured at high frequency. Footprint analysis.

5. Remote sensing applications.

The land surface temperature, LST . Retrieval of LST depending on how it is measured. Spatial ET estimation using MOST and the Surface Energy Balance, SEBAL, method. A study case over a mountain meadow.

6. The land and the climate.

Phytoclimatic indices. Climate classification. Wind breakers. Climate and comfort.

Risk of fire. Precipitation, drought and soil erosion.

Eixos metodològics de l'assignatura

The lectures are combined with a variety of activities. The latter includes resolution of exercises that are analyzed in class and the use of different packages such as, Agromet, Climgen and TK2, elaboration of reports and preparation of short communications.

Pla de desenvolupament de l'assignatura

Aproximate teaching loads corresponding to Theory, T, and Activities in class, A:

1. Introduction. T= 4 h. A= 2 h

2. The database and the metadata. Weather generators. T= 6 h. A= 6 h.

3. The atmosphere. General and local circulation. Boundary layers. T= 5 h. A= 2 h.

4. The soil – vegetation – atmospheric surface layer continuum. The surface energy balance. T= 10 h. A = 5 h.

5. Remote sensing applications. T= 5 h. A = 5 h.

6. The land and the climate. T= 5 h. A = 5 h.

Sistema d'avaluació

Provided that the student assists regularly to class (a minimum 80% of the total teaching load), the global evaluation is obtained by weighting the marks obtained in different activities. The corresponding weights are the following: 70% for exercises and 30% for reports and oral communications. Activities are made in grup. A grup is formed by 2 - 3 persons. The Table lists the number of activities per lecture and the weight per lecture versus the final mark: However, when a student shows up by less than 80% of the classes, the mark correspond to the score obtained in an exam.

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Lecture	Number of activities and Exercices	Total weight (%)
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Lecture 1	3	3	8.6
Lecture 2	3	8	20.6
Lecture 3	2	7	18.6
Lecture 4	4	12	40
Lecture 5	2	3	10.6
Lecture 6	3	3	10.6
TOTAL	17	36	100

Bibliografia i recursos d'informació

The lectures are available in Sakai (campus virtual).

Complementary material:

Allen, R.G.; Pereira, L.S.; Raes, D., Smith, M. 1998. Crop evapotranspiration. Guidelines for computing crop water requirements. FAO Irrigation and drainage paper n. 56. FAO Roma (Italia). 300 pp.

Campbell G.S.; J.M: Norman. 1998. An introduction to Environmental Biophysics. 2nd Edition. Springer. 286pp.

Critchfield, H.J., 1983: General Climatology. Prentice-Hall.

Elías Castillo, F. y F. Castellvi (coords.), 2001: Agrometeorología. Ed. Mundi-Prensa. Monteith, J.L.; M.H. Unsworth. 1990. Principles of Environmental Physics. 2nd Edition. Edward Arnold. 291pp.

Rosenberg N.J.; Blad B.; Verma S.B. 1983. Microclimate. The Biological Environment. 2nd ed. John Wiley & Sons.

R.G.Allen, L.S. Pereira, D. Raes, M. Smith., 2006: Evapotranspiración del cultivo. Guías para la determinación de los requerimientos de agua de los cultivos. (Estudio FAO Riego y Drenaje 56), Roma, 323 p (traducción del original en Inglés del año1998).

Foken, T., 2008. Micrometeorology. Ed. Springer.

Hatfield, J.L., Baker, J.M., (Editors)., 2005. Micrometeorology of Agricultural Systems. American Society of Agronomy Monograph Series No. 47. ASA-CSSA-SSSA. Madison, WI. p. 584.