Course teaching guide

Course	LEARNING BY DOING: ADAPTATIVE MANAGEMENT		
Subject area			
Module	OPTATIVE		
Degree	Máster en Gestión Forestal basada en Ciencia de Datos - Forest Management based on Data Science & Master in Mediterranean Forestry and Natural Resources – MEDFOR		
Curriculum	572/506	**Code**	54279/53030
When taught	1st Quarter	**Type/Category**	ELECTIVE
Level/Cycle	MASTER DEGREE	**Year**	2º
ECTS Credits	6 ECTS		
Language of instruction	English		
Teacher/s in charge	Dr. Felipe Bravo……3 ECTS (Course responsible) Dr. Miren del Río 1 ECTS Dr. Andrés Bravo Oviedo 1 ECTS Dr. Ricardo Ruiz Peinado 1 ECTS		
Contact details (e-mail, telephone no.…)	Dr. Felipe Bravo, fbravo@pvs.uva.es (coordinator) Phone: 979-108424 / Building E (Office 208) Curriculum Vitae: http://sostenible.palencia.uva.es/users/fbravo | https://www.researchgate.net/profile/Felipe_Bravo4 | https://www.linkedin.com/in/felipebravooviedo/ Dr. Miren del Río rio@inia.es Curriculum vitae: http://sostenible.palencia.uva.es/users/delrio Dr. Andrés Bravo Oviedo bravo@inia.es Curriculum vitae: http://sostenible.palencia.uva.es/users/andresbravo Dr. Ricardo Ruiz Peinado ruizpein@inia.es Curriculum vitae http://sostenible.palencia.uva.es/users/rruiz		
Tutorial hours	See at www.uva.es > Masteres >Título correspondiente>Tutorías		
Department	INSTITUTO UNIVERSITARIO DE INVESTIGACIÓN EN GESTIÓN FORESTAL SOSTENIBLE (iuFOR)		

1. Situation /Relevance of the Course

1.1 Contextualisation

Forests are facing new global demands and stresses that require new forestry strategies. Forester needs new foundations that allow them to develop forestry strategies to provide goods and services while ecosystems structure and functions are maintained and enhanced. Thus this course provides methods and foundations that will allow students to apply this advanced knowledge to address and develop these new forestry strategies.

1.2 Relation with other subject areas

This course is closely related with Multifuntional silviculture and with Modelización Forestal y Ambiental (DATAFOREST).

1.3 Pre-requirements

None

2. Skills

2.1 General

Following the Dublin Descriptors, students of this course must:

i) have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research3 context;
ii) can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;
iii) have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;
iv) can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
v) have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.

2.2 Specific

With this course, students will acquire the following specifics skills:

E5 Capacidad para usar correctamente instrumentos de medición de masas arboladas, así como las técnicas y herramientas de la gestión forestal/Ability to use properly measurement instruments in forest stands and tools and methods of forestry
E12 Capacidad para la comprensión y desarrollo de aplicaciones relacionadas con la gestión de datos de sistemas forestales/Ability to understand and develop applications related to the management of data from forest systems.

3. Aims

Students will be able to design, manage and apply techniques on (i) Adaptive Management, (ii) Forest Management under global change, (iii) silvicultural path design, (iv) quantitative silviculture and (v) monitoring, experimentation and data analysis.

Besides that, students will be able to critically select, read and assess scientific literature related with the course

4. Thematic blocks[1]

Block 1:

Work load in ECTS credits: 6

a. Contextualisation and justification

See course context

b. Learning objectives

See course objectives

c. Content

PRINCIPLES (1 ECTS)
- Adaptive Management (AM)Foundations
- AM Types (Active vs Pasive)
- Rooting on Forest Management traditional approach
- Policy, legal and institutional framework
- Social participation
- Differences between Adaptive Management and Management for adaptation

TOOLS (2 ECTS)
- Experimentation in forestry
- Sampling and monitoring
- Silvicultural path design and analysis
- Modelling and simulation
- Supervised and unsupervised classification (machine learning)

CASE STUDIES (3 ECTS)
- Mixing effect (Nelder wheels, triplets,…)
- Tree marking analysis (Marteloscope)
- Thining response (Thining experiments)
- Forest structure monitoring and assessment (Allometry, biomass equations, Coarse Woody Debry sampling)
- Site productivity (site index curves and site index classification)

d. Method of teaching

A combination of theory, problems, seminars and field trips jointly with independent study and group study will be used.

e. Work plan

Classes will take place during the first 5 weeks of the first semester according with published schedule. Classroom to be determined yearly.

f. Assessment

Course requirements include active participation (10%), the presentation of a class summary (10%), a class project (30%) and a final exam (50%).

g. Basic references

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James, G., Witten, D., Hastie, T., Tibshirani, R., Friedman, J. 2013 The elements of statistical learning. Data mining, inference and prediction. Springer 745 pag. http://www-bcf.usc.edu/~gareth/ISL/
Jones, O., Maillardet, R., Robinson, A. (2009). Introduction to scientific programming and simulation using R. CRC Press, 453 p.
Kershaw, J.A, Ducey, M.J., Beers, T.W., Husch, B. 2016 Forest Mensuration, 5th Ed. Wiley
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Wood, S.N. (2006). Generalized additive models. An introduction with R. CRC Press, Texts in Statistical Science series, 392 p.

h. Complementary references

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Bravo, F., LeMay, V., Jandl, R. 2017. Managing Forest Ecosystems: The Challenge of Climate Change. Springer, 452 pp
Corona P (2016) Consolidating new paradigms in large-scale monitoring and assessment of forest ecosystems. Environ Res 144:8–14. doi: 10.1016/j.envres.2015.10.017
Davis, L.S., Johnson, K.N., Bettinger, P.S., Howard, T.E. (2001) Forest management McGraw Hill, 804 pp
Diéguez, U., Barrio, M., Castedo, F., Ruíz, A.D., Álvarez, M.F., Álvarez-González, J.G., Rojo. A. (2003) Dendrometría Mundi-Prensa 327 pp
Dieguez-Aranda, U. et al. 2010. Herramientas silvícolas para la gestión forestal sostenible en Galicia. Xunta de Galicia. (Disponible en: http://mediorural.xunta.es/fileadmin/arquivos/publicacions/herramientas_selvicolas.pdf)
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Larocque G.R., Luckai N., Adhikary S.N., Groot A., Bell F.W., Sharma M. (2013) Competition theory-science and application in mixed forest stands: review of experimental and modelling methods and suggestions for future research. Environ Rev 21, 71-84.
Makela, A., del Rïio, M. et al. (2012). Using stand-scale forest models for estimating indicators of sustainable forest management. Forest Ecology and Management 285: 164-178
Messier C, Puettmann K, Chazdon R, et al (2015) From Management to Stewardship: Viewing Forests As Complex Adaptive Systems in an Uncertain World. Conserv Lett 8:368–377. doi: 10.1111/conl.12156
Picard N., Saint-André, L., Henry, M., 2012. Manual for building tree volume and biomass allometric equations: from field measurement to prediction. Food and Agricultural Organization of the United Nations (FAO), Rome, 215 pp.
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Vanclay, J.K. (1994) Modelling forest growth and yield. Applications to Mixed Tropical Forests. CAB International, Wallingford, 312 pp
http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1538&context=esm_pubs

i. Resources required

No special resources

j. Timing

THEMATIC BLOCK	ECTS LOAD	EXPECTED PERIOD OF TIME
ONE	6	First 5 week of the 1st Quarter

5. Didactic methods

Lectures, field trips, writing assessment and on field discussions.

6. Table of student's dedication to the course

ONSITE ACTIVITIES	HOURS	OFFSITE ACTIVITIES	HOURS
Theory	15	Individual study	60
Practical work (Problems,…)	10	Group study	30
Labs			
Field trips	25		
Seminars	8		
Groups meetings			
Evaluation	2		
Total onsite	**60**	**Total offsite**	**90**

7. Summary table of instruments, procedures and assessment/marking/grading systems

Course requirements include active participation (10%), the presentation of a class summary (10%), a class project (30%) and a final exam (50%).

INSTRUMENT/PROCEDURE	WEIGHT IN THE FINAL MARK/GRADE	REMARKS
Activity dossier	10 %	
Class project:	30 %	
Active participation in the course	10 %	
Final exam	50 %	Theory questions (test and short questions) and problems resolution

8. Final considerations

In case a student fails in the first call of the academic year in second round the written exam will stand alone for grading.