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	572/506	572/506
When taught	1st Quarter	1st Quarter	1st Quarter
Level/Cycle	MASTER DEGREE	MASTER DEGREE	MASTER DEGREE
ECTS Credits	6 ECTS		
Language of instruction	English		
Lecturer/s in charge	Dr. Felipe Bravo (Course responsible), Dr. Miren del Río, Dr. Andrés Bravo Oviedo and Dr. Ricardo Ruiz Peinado		
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.csic.es Curriculum vitae: http://sostenible.palencia.uva.es/users/delrio Dr. Andrés Bravo Oviedo bravo@mncn.csis.es Curriculum vitae: http://sostenible.palencia.uva.es/users/andresbravo Dr. Ricardo Ruiz Peinado ruizpein@inia.csic.es Curriculum vitae http://sostenible.palencia.uva.es/users/rruiz		
Tutorial hours	See at www.uva.es > Masteres >Título correspondiente>Tutorías		
Department	PRODUCCIÓN VEGETAL Y RECURSOS FORESTALES and external professors from CSIC		
Degree Commitee revision	July 20th, 2023		

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 semester according with published schedule.

f. Assessment

Course requirements include the development of a Project proposal (10%) a Class project (50%), Active participation in the course through deliverables at the ecampus (20%) and Final exam (20%)

g Didactic resources

Esta sección será utilizada por la Biblioteca para etiquetar la bibliografía recomendada de la asignatura (curso) en la plataforma Leganto, integrada en el catálogo Almena y a la que tendrán acceso todos los profesores y estudiantes. Es fundamental que las referencias suministradas este curso estén actualizadas y sean completas. Los profesores tendrán acceso, en breve, a la plataforma Leganto para actualizar su bibliografía recomienda ("Listas de Lecturas") de forma que en futuras guías solamente tendrán que poner el enlace permanente a Leganto, el cual también se puede poner en el Campus Virtual.

g.1 Basic references

Burkhart, H.E., Tomé, M. 2012. Modeling Forest Trees and Stands, Springer

Bocard, D., Gillet, F., Legendre, P. (2011). Numerical Ecology with R, Springer UseR! Series 306 p.

Robinson, A.P, Hamman J.D. 2011. Forest Analytics with R: An Introduction. Springer ISBN 978-1-4419-7761-8

Hastie, T., Tibshirani, R. 2015 An introduction to statistical learning with applications in R. Springer 426 pag. http://statweb.stanford.edu/~tibs/ElemStatLearn/

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

Messier, C., Puettmann, K.J., Coates, K. D. (2013). Managing forests as complex adaptive systems. Building resilience to the challenge of global change. The Earthscan Forest Library from Routledge, 353 p.

Pommerening, A., Grabarnik, P. (2019) Individual-based Methods in Forest Ecology and Management Springer, DOI:10.1007/978-3-030-24528-3

Pretzsch, H. 2009 Forest dynamics, Growth and Yield Springer 664 pp

Schreuder HT, Ernst R, Ramirez-Maldonado H (2004) Statistical Techniques for Sampling and Monitoring Natural Resources. Rocky Mt. Res. Stn. 111 p.

Weiskittel, A., Hann, D.W., Kershaw, J.A., Vanclay, J.K 2011 Forest Growth and Yield Modeling Wiley

Wood, S.N. (2006). Generalized additive models. An introduction with R. CRC Press, Texts in Statistical Science series, 392 p.

g.2 Complementary references

Anand, M., González, A., Guichard, F., Kolasa, J., Parrott, L. (2010). Ecological systems as complex systems. Challenges for an emerging science. *Diversity* 2, 395-410 doi: 10.3390/d2030395, http://www.mdpi.com/1424-2818/2/3/395

Bate, L.J., E.O. Garton, M.J. Wisdom (1999) Estimating snag and large tree densities and distributions on a landscape for wildlife management General Technical Report, Forest Service, USDA, PNW-GTR-425, 76 pp http://www.fs.fed.us/pnw/pubs/pnw_gtr425.pdf

Bravo, F., Herrero, C., Ruano, I., Bravo-Núñez, A., Wilson, L., Riofrío, J.G. 2015. Análisis de datos selvícolas con R. Universidad de Valladolid http://uvadoc.uva.es/handle/10324/11889

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)
Doblas-Miranda E, Martinez-Vilalta J, Lloret F, et al (2015) Reassessing global change research priorities in mediterranean terrestrial ecosystems: How far have we come and where do we go from here? Glob Ecol Biogeogr 24:25–43. doi: 10.1111/geb.12224
Filotas E, Parrott L, Burton PJ, et al (2014) Viewing forests through the lens of complex systems science. Ecosphere 5:1–23. doi: 10.1890/ES13-00182.1
Forrester D.I. (2014) The spatial and temporal dynamics of species interactions in mixed-species forests: from pattern to process. For Ecol Manage 312, 282-292
Gadow, K. von, Hui, G. (1999) Modelling forest development Kluwer Academic Pub., Dordrecht, 213 pp
Gregoire, T.G., G.J. Buhyoff (1999) Sampling and estimating recreational use General Technical Report, Forest Service, USDA, PNW-GTR-456, 39 pp https://www.fs.fed.us/pnw/pubs/gtr_456.pdf
Jandl R., Lindner, M., Vesterdal, L., Bauwens, B., Baritz, R., Hagedorn, F., Johnson, D.W., Minkkinen, K., Byrne, K.A., 2007. How strongly can forest management influence soil carbon sequestration? Geoderma 137: 253-268.
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 Rïo, 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.
Pretzsch H., del Río M., Ammer C., Avdagic A., Barbeito I., Bielak K. et al. (2015) Growth and yield of mixed versus pure stands of Scots pine (Pinus sylvestris L.) and European beech (Fagus sylvatica L.) analysed along a productivity gradient through Europe. Eur J For Res, 134, 927–947.
Ratkovsky, DA. 1989. Handbook of nonlinear regression models. Statistics text books and monographs. Vol. 107. Marcel Dekker, inc.
Río M., Pretzsch H., Alberdi I., Bielak K., Bravo F., Brunner A. et al (2016) Characterization of the structure, dynamics, and productivity of mixed species stands: review and perspectives. Eur J For Res, 135, 23–49
Rist L, Felton A, Mårald E, et al (2016) Avoiding the pitfalls of adaptive management implementation in Swedish silviculture. Ambio 45:140–151. doi: 10.1007/s13280-015-0750-9
Ruiz-Peinado R., Bravo-Oviedo, A., López-Senespleda, E., Montero, G., Río, M. 2013. Do thinnings influence biomass and soil carbon stocks in Mediterranean maritime pinewoods? European Journal of Forest Research 132: 253-262.
Sabin TE, Stafford SG. 1990. Assessing the need for transformation of response variables. Forest Research Lab. Special publication 20. Oregon State University (https://ir.library.oregonstate.edu/xmlui/handle/1957/32209)
Topp-Jorgensen E, Poulsen MK, Lund JF, Massao JF (2005) Community-based monitoring of natural resource use and forest quality in montane forests and miombo woodlands of Tanzania. Biodivers Conserv 14:2653–2677.
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

g.3 Other online resources (píldoras de conocimiento, blogs, videos, revistas digitales, cursos masivos (MOOC), …)

h. Resources needed

No special resources needed

i. Timing

Workload in ECTS	Period
6 ECTS	First semester

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	16	Individual study	60
Practical work (Problems,…)	22	Group study	30
Labs			
Field trips	10		
Seminars	10		
Groups meetings			
Evaluation	2		
Total onsite	**60**	**Total offsite**	**90**
		TOTAL	**150**

7. System characteristic of the evaluation

INSTRUMENT/PROCEDURE	WEIGHT IN THE FINAL GRADE	OBSERVACIONS
Project proposal	10%	
Class project:	50%	
Active participation in the course	20%	Different activities will be included in ecampus (moodle)
Final exam	20%	Theory questions (test and short questions) and problems resolution

GRADING CRITERIA
• **First call (*Convocatoria ordinaria*):** The final grade will be the sum of the partial grades weighted according to the previous table. It is compulsory to obtain at least a 5 in the exam. • **Second call (*Convocatoria ordinaria*):** Students can present the Project (for the first time or with improvements) and must take the exam again. The final grade will be the sum of the partial grades weighted according to the previous table. It is compulsory to obtain at least a 5 in the exam.

8. Important remarks

Plagiarism is not allowed. Students failing in plagiarism will get a 0 (zero) in the call and the University will be informed for academic punishment.