

<b>Program</b>	13AD – Master’s Degree in Forest Engineering
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Course number and name	
<b>Number</b>	
<b>Name</b>	Forest Resilience
<b>Semester</b>	S2 [(February-June)]

Credits and contact hours	
<b>ECTS Credits</b>	3
<b>Contact hours</b>	30

<b>Coordinator's name</b>	Pilar Pita Andreu (pilar.pita@upm.es)
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Specific course information	
<b>Description of course content</b>	
<p>This course aims at discussing about the response of trees and forests to both biotic and abiotic stressful factors, focusing on those most related to increasing atmospheric CO<sub>2</sub> and global change. Attention is also given to main threats to forest regeneration. Both theory lessons and laboratory/field sessions will help the student to better understand methodologies and techniques used to assess plant's response to stress. As part of the evaluation procedure, students may participate in debates about different topics discussed in general or specialized media, supporting opposite points of view.</p>	
<b>List of topics to be covered</b>	
<p><b>Topic 1.</b> The physiology of tree responses to increased atmospheric CO<sub>2</sub>  <b>Topic 2.</b> CO<sub>2</sub> exchange between forest ecosystems and the atmosphere.  <b>Topic 3.</b> Tree responses to climate changes and extreme meteorological events  <b>Topic 4.</b> The effects of ageing on tree responses to stress  <b>Topic 5.</b> Forest resilience to pathogens and pests in the context of global change.  <b>Topic 6.</b> The impact of herbivory on forest trees.  <b>Topic 7.</b> Resilience in agroforestry systems: examples from California and Spain  <b>Topic 8.</b> Forest dynamics. Main threats to natural regeneration</p>	
<b>Prerequisites or co-requisites</b>	
None	
<b>Course category in the program</b>	
__ R (required)	_X_ E (elective) <i>(elective courses may not be offered every year)</i>

**Specific goals for the course**

**Specific outcomes of instruction**

Offer up-to-date information on tree and forest responses to Global Change  
 Develop ecological indicators to assess the resilience of forest and agroforestry systems  
 Integrate resilience into sustainable forest management  
 Identify biotic threats to forests and management measures to increase resilience

**Bibliography and supplementary materials**

Please note, this list is not exhaustive.

Gill, R. M. A. (1992). A review of damage by mammals in north temperate forests: Impact on trees and forests. *Forestry: An International Journal of Forest Research*, 65(4), 363-388.

Morellet, N., Gaillard, J. M., Hewison, A. M., Ballon, P., Boscardin, Y. V. E. S., et al. (2007). Indicators of ecological change: new tools for managing populations of large herbivores. *Journal of Applied Ecology*, 44(3), 634-643.

López-Sánchez, A., Peláez, M., Dirzo, R., Fernandes, G. W., Seminatore, M., Perea, R. (2019). Spatio-temporal variation of biotic and abiotic stress agents determines seedling survival in assisted oak regeneration. *Journal of Applied Ecology*, 56(12), 2663-2674.

**Teaching methodology**

<u>  X  </u> lectures	<u>    </u> problem solving sessions	<u>    </u> collaborative actions	<u>  X  </u> laboratory sessions
<b>Other:</b>			