

<i>Universitat Politècnica de Catalunya (UPC)</i>	
<i>Module Title:</i> <u>INTRODUCTION TO MAS</u>	
<i>Module Organiser:</i> Michel André	<i>Module Staff:</i> Invited Speakers
<p><i>Module Aim:</i></p> <p>The goal of this module is to introduce the objectives of the master and to give an overview of the employment opportunities after completing the master degree. Speakers from the industry (Marine Technology, Offshore Companies, Naval Institutes, etc.) will present their companies and their needs in terms of engineers in marine acoustics.</p>	

<i>ENSIETA- Universitat Politècnica de Catalunya (UPC)</i>	
<i>Module Title:</i> <u>PRINCIPLES OF UNDERWATER ACOUSTICS</u>	
<i>Module Organiser:</i> Dr. Rafael Bartolomé	<i>Module Staff:</i> Rafael Bartolomé, Mike van der Schaar
<p><i>Module Aim:</i></p> <p>The goal of this module is to ensure that all MAS students are at the same level in underwater acoustics and related fields.</p>	
<p><i>Module Objectives:</i></p> <ul style="list-style-type: none"> - Introduction to underwater acoustics - Introduction to MATLAB - Refresher course in basic calculus, probability theories and statistics 	

<i>Universitat Politècnica de Catalunya (UPC)</i>	
<i>Module Title:</i> <u>DIGITAL SIGNAL PROCESSING</u>	
<i>Module Organiser:</i> Dr. Rafael Bartolomé	<i>Module Staff:</i> Rafael Bartolomé, Carine Simon, Mike van der Schaar
<i>Module Aim:</i> to teach advanced signal processing protocols used for most common marine data acquisition systems	
<p><i>Module Objectives:</i> The objective of the module is to provide the student with the necessary expertise to analyse signals in different time-frequency representations, perform feature extraction and search for patterns. Discrete-time signal processing is a field with a wide range of applications including speech and data communication, acoustic, radar, sonar, seismology, remote sensing, instrumentation and many others.</p>	
<p><i>Learning Outcomes:</i></p> <p>On successful completion of this module, the student should have:</p> <ul style="list-style-type: none"> • Theory and Application of Digital Signal Processing • A selection of the most used signal processing operations in a general industrial setting, including data acquisition and real-time applications • Understand and use DSP algorithms and special-purpose DSP hardware ICs 	

<i>Universitat Politècnica de Catalunya (UPC)</i>	
<i>Module Title:</i> <u>INSTRUMENTATION</u>	
<i>Module Organiser:</i> Prof. Antoni Mánuel	<i>Module Staff:</i> Antoni Mánuel, Carine Simon, Eric Delory, Shahram Shariat,
<i>Module Aim:</i> To transfer the knowledge of the methods of marine parameter measurements and associated electronic technology to the students.	
<i>Module Objectives:</i> The students will learn how to design and build an acquisition system taking into account the specifications of the measurement. This design will also take into account the specificities of the considered marine environment.	
<i>Learning Outcomes:</i> On successful completion of this module, the student should have: <ul style="list-style-type: none"> • To train engineers in the advanced methods of electronic instrumentation with regard to the data and signals (sound, images, shapes, etc ...) acquisition , transmission, and processing of information, • Networks: (telephonic, telematic, computers, internet, ...) and transmission channels are studied both theoretically and practically. • Solid scientific knowledge of the marine environment and the relevant instrumentation technologies • To create the basis for the future observatories architecture design 	

<i>ENSIETA- Universitat Politècnica de Catalunya (UPC)</i>	
<i>Module Title:</i> <u>NON ACOUSTIC SENSING AND MOBILE SENSOR SYSTEMS</u>	
<i>Module Organiser:</i> Prof. Arnaud Coatanhay	<i>Module Staff:</i> A.Coatanhay, A. Khenchaf, N. Seube,
<i>Module Aim:</i> The goal of this module is on one hand to present the electromagnetic systems (Radar, Lidar, ...) applied to monitor the marine environment and on the other hand to present marine robotic systems	
<i>Module Objectives:</i> Remote sensing: this course has to describe physical phenomena due to the interaction between electromagnetic waves and sea. Then, different sensing devices are presented: radar system, optic sensors, satellites. Finally, electromagnetic measurement are shown to be related to ocean data (biology, sea surface characteristics, pollution, ...). Design and control of oceanographic mobile sensor : The module has three components involving the study of Key technologies for floats and gliders, Floats and Glider dynamics and control. Design of in-board control system, Routing and distributed control of multiple floats and gliders	
<i>Learning Outcomes:</i> On successful completion of this module students will be able to: <ul style="list-style-type: none"> - Understand physical phenomena involved in non-acoustic sensing. - Know different technologies and systems dedicated to sea monitoring using an electromagnetic approach. - Know of which ocean characteristics can be detected by electromagnetic devices. - General knowledge of technologies that are used in advanced oceanographic sensors such as floats and gliders (mechanical design, sensors, energy sources, actuators, computing resources). 	

ENSIETA- Universitat Politècnica de Catalunya (UPC)	
<i>Module Title:</i> <u>IMAGING SONAR TECHNOLOGY AND PROCESSING</u>	
<i>Module Organiser:</i> Prof. M. Legris	<i>Module Staff:</i> Michel Legris, Mike van der Schaar, Eric Delory
<p><i>Module Aim:</i></p> <p>The goal of this module is to have a broadview on current and emerging technologies in active and multi-static passive sonar imaging and also to know how to interpret and process data from such systems.</p>	
<p><i>Module Objectives:</i></p> <p>The objective is three folds :</p> <ul style="list-style-type: none"> - first we will introduce the different design choices available and usable in imaging, presenting also advanced concepts such as synthetic aperture sonar or interferometric sonars - then we will have a thorough investigation on how such data is usually processed, - in a last part passive multi-static imaging sonar systems are introduced 	
<p><i>Learning Outcomes:</i></p> <p>On successful completion of this module students will be able to:</p> <ul style="list-style-type: none"> ☞ to understand principles and theories behind each sonar systems; ☞ to determine the key points in sonar design and which parameters will impact sonar performances; ☞ to interpret sonar images and artifacts on real data; ☞ to realize the feasibility study of an acoustic imaging system. 	