Course guide
230350 - MTI - Marine Technology Instrumentation

Last modified: 13/05/2015

Unit in charge:	Barcelona School of Telecommunications Engineering
Teaching unit:	710 - EEL - Department of Electronic Engineering.

Degree:	**Academic year:** 2013	**ECTS Credits:** 5.0
Languages: English		

LECTURER

Coordinating lecturer:	Joaquin del Rio Fernandez
Others:	Daniel Mihai Toma, Spartacus Gomariz

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE1. Ability to apply information theory methods, adaptive modulation and channel coding, as well as advanced techniques of digital signal processing to communication and audiovisual systems.
CE2. Ability to develop radio-communication systems: antennas design, equipment and subsystems, channel modeling, link dimensioning and planning.
CE3. Ability to implement wired/wireless systems, in both fix and mobile communication environments.
CE4. Ability to design and dimension transport, broadcast and distribution networks for multimedia signals
CE8. Ability to understand and to know how to apply the functioning and organization of the Internet, new generation Internet technologies and protocols, component models, middleware and services
CE14. Ability to develop electronic instrumentation, as well as transducers, actuators and sensors.

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

- Lectures
- Laboratory classes
- Laboratory practical work
- Oral presentations
- Extended answer test (Final Exam)

LEARNING OBJECTIVES OF THE SUBJECT

Learning objectives of the subject:
The aim of this course is to train students in methods of design, dimensioning and evaluation of data communications networks. First, we consider the parameters of interest for telematics network planning and mathematical tools we have. Then, using this knowledge, will study data routing mechanisms, network allocation capacity, congestion control and multiple access techniques.

Learning results of the subject:
- Ability to specify, design networks, services, processes and applications of telecommunications in both a fixed, mobile, personal, local or long distance, with different bandwidths in multicast networks, including voice and data.
- Ability to apply both traffic engineering tools as planning tools, dimensioning and network analysis.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	36.00
Self study	80,0	64.00

Total learning time: 125 h

CONTENTS

Content:

Description:
1. Image processing for submarine video images.
2. Electric Power Quality and Ship Accidents
3. Smartphone and augmented reality for on-site and remote applications in the field of measurements
4. Introduction to signal preprocessing circuits for sensors and description of digitizing circuits (parameters, errors, error correction methods, ADC architectures and models, ADC testing
5. Measure of water quality (conductivity, turbidity, pH, etc.) and IEEE 1451 family of standards in marine instrumentation
6. Wireless Sensor Networks (WSN): introduction and applications. Distributed measurement systems for water quality monitoring; WSN with underwater links. GPS and its use in surface and underwater navigation
7. Tracking and labeling of species. Hydrophones, ceramic piezoelectrics, audio amplifiers Digital communication applied to underwater acoustics
8. Navigation, related sensors and measuring systems.
9. Practice on navigation, related sensors and measuring systems
10. Introduction to Wireless Sensor Network. DAC basics. Overview of instrumentation and measurement chain. Introduction to oceanographic measurement systems: properties, applications and technology challenges
11. Inertial, classical and electronic compass navigations, LORAN, GPS, magnetic sensors and underwater magnetic observatories and communication basics - from modulations to GNSS.
12. Analog functions for measurement signals

Full-or-part-time: 125h
Theory classes: 60h
Laboratory classes: 37h 30m
Guided activities: 15h
Self study : 12h 30m

GRADING SYSTEM

Group assessments: 100%

EXAMINATION RULES.

Laboratory :

P1. Matlab with the toolbox "image processing"

P2 Image processing in OBSEA observatory

P3 Use of LabView as a tool in the design of the measurement systems applied to the marine environment, exercises using real time FPGA system myRIO

P4: Acquisition and signal processing using Matlab

P5. Use of Matlab for underwater acoustics simulations

P6. Coastal ocean observatories and Radio link

P7. Equipment for measuring the water column. Measurement of conductivity and depth. Calibration of CTDs

P8. Navigation test with Guanay II. Motion simulation with Matlab-Simulink

P9. "Plug & work" and time synchronization of instruments

P10. Numerical simulations of rigid body motion and a simple multi-body system using Matlab-Simulink

P11. Navigation and payload sensors: inertial navigation system, Accelerometers, Gyroscopes, Global Navigation Satellite System

Oral presentation:

- Description: Presentation of a work group.

BIBLIOGRAPHY

Basic:

- Fossen, Thor I. Marine control systems : guidance, navigation and control of ships, rigs and underwater vehicles. Trondheim: Marine Cibernetics, cop. 2002. ISBN 82-92356-00-2.

- Scientific papers from Journal of Oceanic Engineering Society [on line]. Available on: http://www.oceanicengineering.org.- Urick, Robert J. Sound propagation in the sea. Los Altos, California: Peninsula Publishing, 1982. ISBN 978-0932146083.

- G.N. Roberts and R. Sutton . Advances in unmanned marine vehicles. 2006. IEE, ISBN 978-086341-450-3.

- Watson, John; Zielinski, Oliver. Subsea optics and imaging. Sawston, Cambridge: Woodhead Publishing Ltd, 2013. ISBN 978-0857093417.