Code: 1401 **Management and Conservation of Estuarine Systems**
Degree: 2nd cycle – Natural Resources Management and Conservation
Curricular Year: 1st **Semester Course: 2nd**
Credits: 6 ECTS **Compulsory**
Language: Portuguese/English
Responsible: Pedro Raposo de Almeida
Other lecturer(s): Pedro Raposo de Almeida and Cristina Gama Castro Pereira
Web Site: http://www.isa.utl.pt/home/node/3872

1. Contact hours:
Lectures 12 **Practicals/Laboratory** 18 **Praticals/Workfield** 12 **Others** 1.5 **Total** 43.5

2. Objectives:

Students' competences will be related with learning themselves and utilizing the new knowledge in new situations. Moreover, they contact with ecological fundamental competences as experimental design, statistic and chart analysis and teamwork.
Objectives:
- To understand the physical processes of the estuarine environment, tide, salinity, temperature, waves, currents and oxygen.
- To understand the biotic and abiotic dynamic of the several estuarine ecosystems as seagrasses and saltmasrshs.
- To study the estuarine dynamic communities: density, distribution (spacial and temporal), composition and estuarine trophic relations.
- To understand biotic and abiotic factors structuring the estuarine communities.
- To relate estuarine nutrients dynamic with estuarine communities, focusing in euthrofication processes.
- To develop an experimental design and an experiment set-up to study the effects of environmental conditions on community dynamics.
- To analyse the "European union water framework directive" and The European Marine and Strategy" as development of an integrative tools to management : Methodologies and indicators ecosystems-based management.
- To applied ecological indicators to a new ecosystem conditions and discuss their performance

3. Programme:

- Abiotic and biotic estuarine processes: Salinity gradient; complex water movements; tide amplitude; tidal currents, waves, mud flats, sandflats, high turbidity levels, land forms such beaches, barrier islands, salt marshes, submerged vegetation seagrass beds; oyster reefs.
- Definition and classification of estuaries: Partially mixed estuaries; Well-mixed estuaries; Highly stratified estuaries and Fjords. Tidal prism.
Distributions of sediments in estuaries: salt-marsh, mud-flats; sand-flats and channels.
Sediment dynamics: Aggregation, trapping and fluxes of sediments in estuaries. Fluid mud. Turbidity maximum. Plumes.
- Estuarine sediments nutrients dynamics: Nitrogen, Carbon cycle, phosphorus cycle and silicon cycle. Sediment nutrient flux and eutrophican process.
- Primary production and detritus in estuarine ecosystem.
- Estuarine food webs: primary consumers.
- The European Marine Strategy: methodologies and indicators for ecosystem-base management.: Implementation, regional dimension, objective setting, indicators and management processes.
- "European union water framework directive": Implemetation, indicators and management processes

4. Bibliography:

Main Bibliography

Angel Borja (2006). The new European Marine Strategy Directive: Difficulties, opportunities, and challenges. EDITORIAL. Marine Pollution Bulletin, Volume 52, Issue 3, 239-242.
Barnes, R. & R. Hughes (1999). An introduction to Marine Ecology (third edition). Oxford: Blackwell Scientific Publications, 286 p.
Boström, C. & E. Bonsdorff (1997). Community structure and spatial variation of benthic invertebrates associated with *Zostera marina* (L.) beds in the northern Baltic Sea. *Journal of Sea Research* **37**: 153-166 .

Day, J. W.; A. S. Hall; W. M. Kemp & Yanez-Arancibia (1989). Estuarine Ecology. John Wiley & Sons. Inc. 558 p.
Giere, O. (1993). Meiobenthology. Berlin, Springer-Verlag, 328 p.
Higgins, P. R. & H. Thiel (1988). Introduction to the study of meiofauna. Washington, D.C., Smithsonian Institution Press, 488 p.
Little, C. (2000). The Biology of Soft Shores and Estuaries. Oxford university Press, 252 p.
McLusky, D. (2004). The estuarine ecosystem. Blackie, Glasgow, second edition, 215 p.

5. Assessment:

The assessment methods included the continuous observation of the work and performance. The projects proposed demand autonomic and group work and the oral presentation and the report will be evaluate

6. Estimated Workload: 162 | 162 | Hours

7. Last Update: | 9/8/2010 |