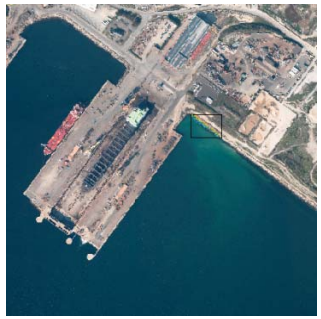

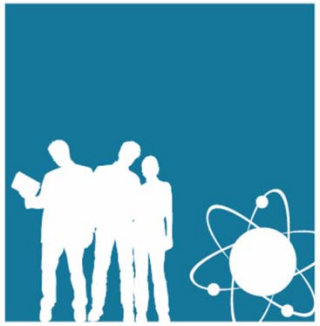

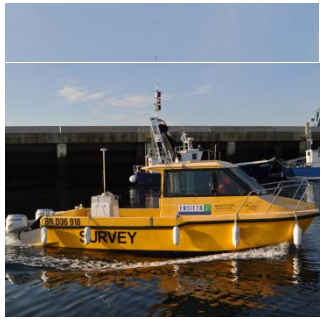

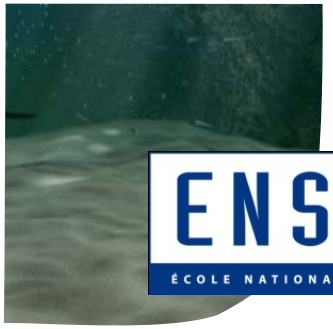

Hydrography at IHO cat A level: Scientific Education, at Sea Training, and Interaction with the Industry

N. Debese , R. Moitié , N. Seube

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ÉCOLE NATIONALE SUPÉRIEURE D'INGÉNIEURS

OUTLINES:

- Introduction
- Course Outline
- Hydrographic Survey training analysis
- Conclusion

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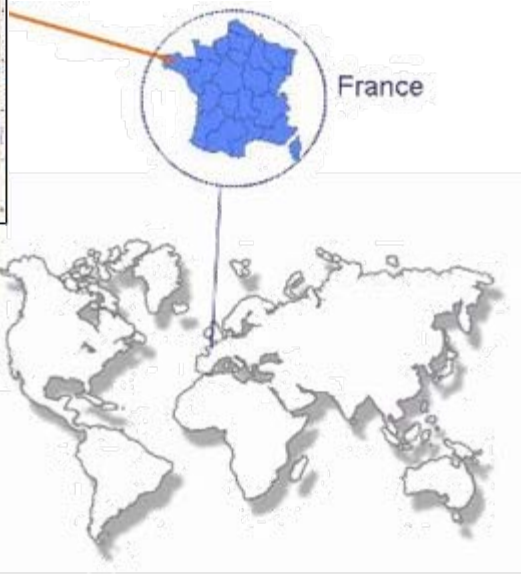

- Located in Brest: takes benefits of the French marine science institutes
- Hydrographic cursus exists since 1971
- 30 graduated students: the largest cat. A course in EU

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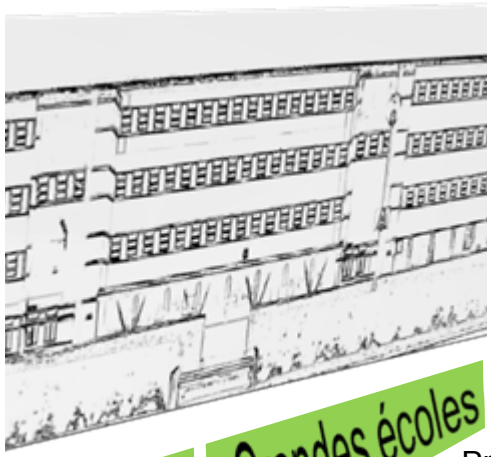
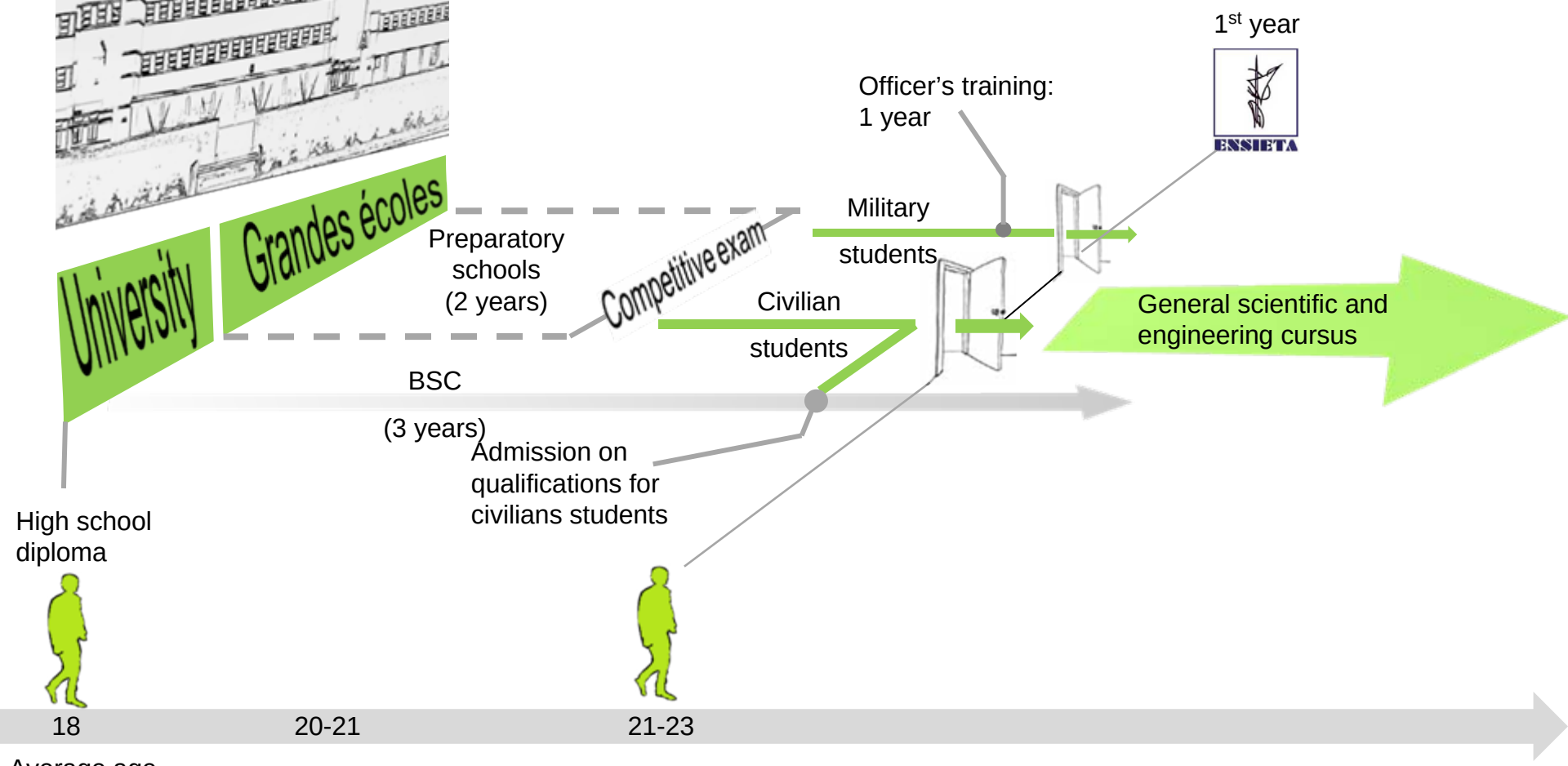
Overview of program structure





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Choice of specialization at the end of the year

1st year

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General scientific and engineering cursus

2nd year

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3rd year

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Electronic systems (30 students)

Mechanical engineering (100 students)

Hydrography (30 students)

Detection and information systems

Naval architecture and offshore engineering

Automotive design modeling

Explosive materials engineering

In parallel of Ensieta cursus

Hydrography / Oceanography

Civilian engineers Private sector

Military engineers DGA SHOM

Ensieta diploma
Master degree

PhD

University

Master (year 1)

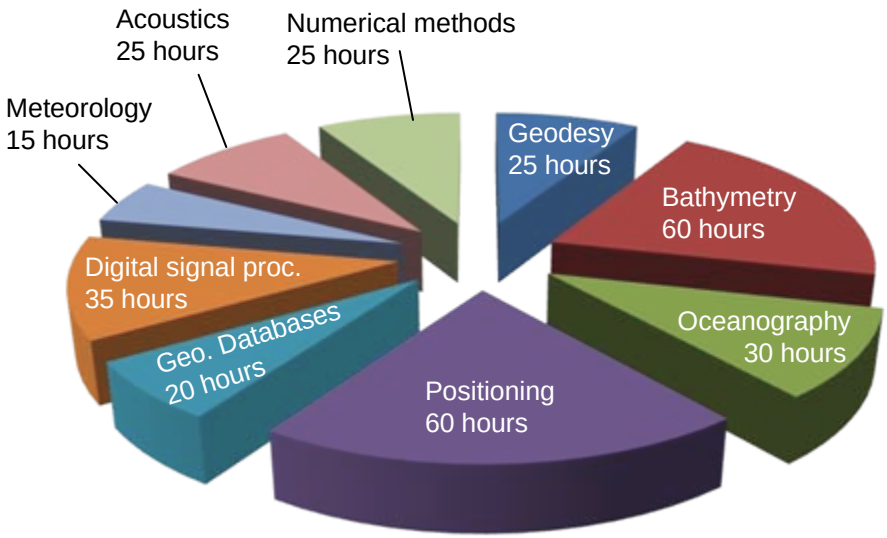
Master (year 2)

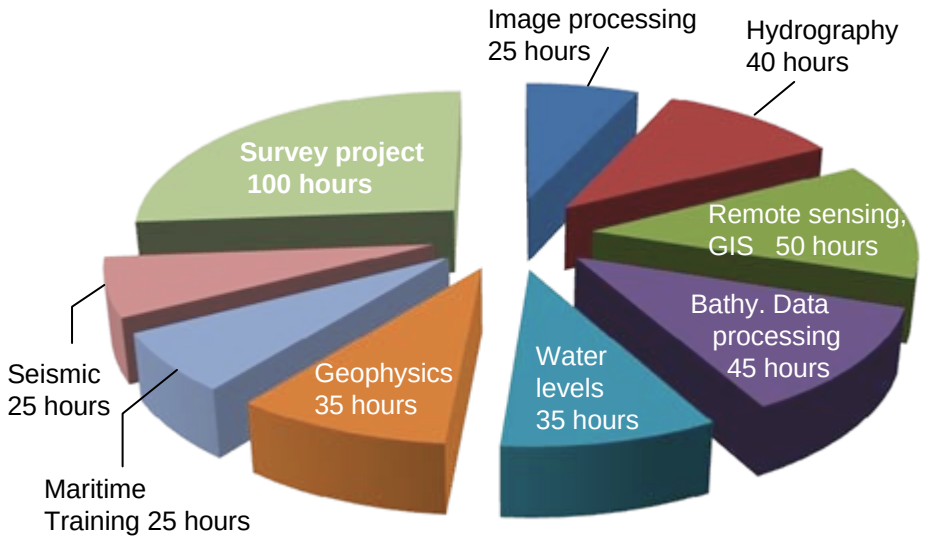
Admission on qualifications for civilians students

23-25

Average age

Outline of the course modules





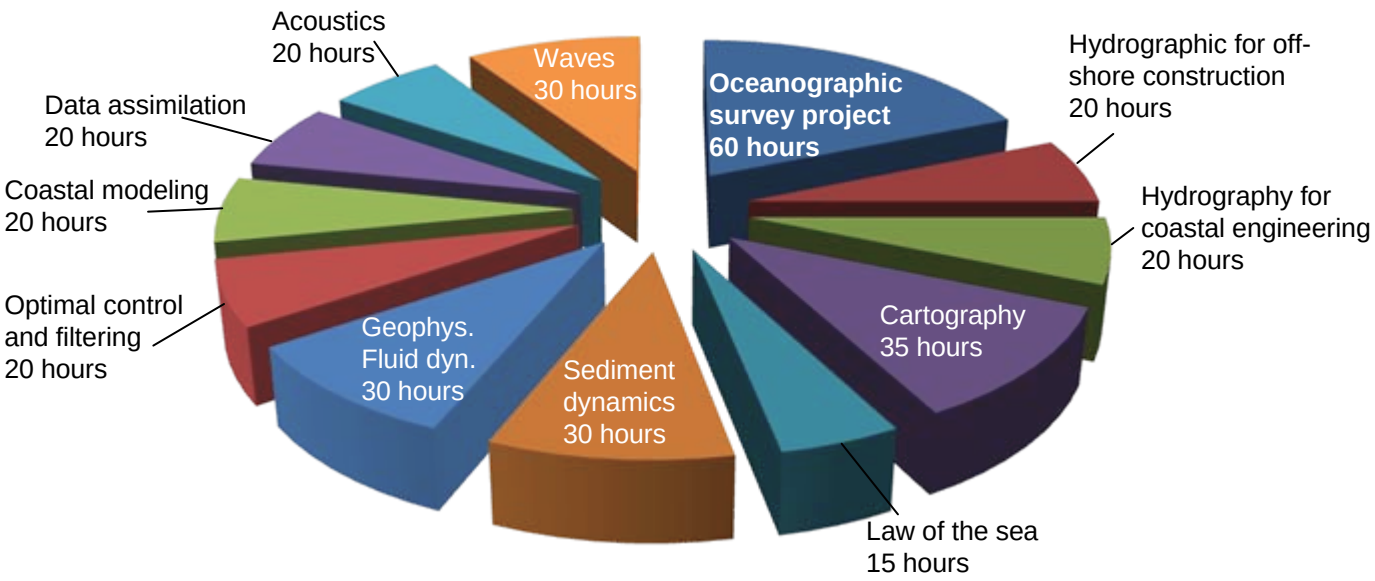
Semester 1

Semester 2

Year 2

Summer training:
2 months in industry

Outline of the course modules



Master thesis: 5 months

Semester 1

Semester 2

Year 3

PRACTICALS:

- The **hydrographic** survey
- The **summer internship**
- The **pre-dredging** survey
- The **oceanographic** survey

- Each student can practice with the ENSIETA survey equipment:

A RTK GPS system

A land based RTK system

Two SBES: Simrad-mesotech 210kHz, 120kHz

Two MBES: A Reson8101, a Tritech Horizon

A sub-bottom profiler: Tritech 210kHz-20kHz

A CTD gauge from Seabird

Two Tide gauges

Sound velocities probes

A GPS compass from Hemisphere

A MRU6 from Seatex

An Octans 4 from IXSEA

Practicals

The survey vessel "Panopée"

The **hydrographic** survey

Teams of three students

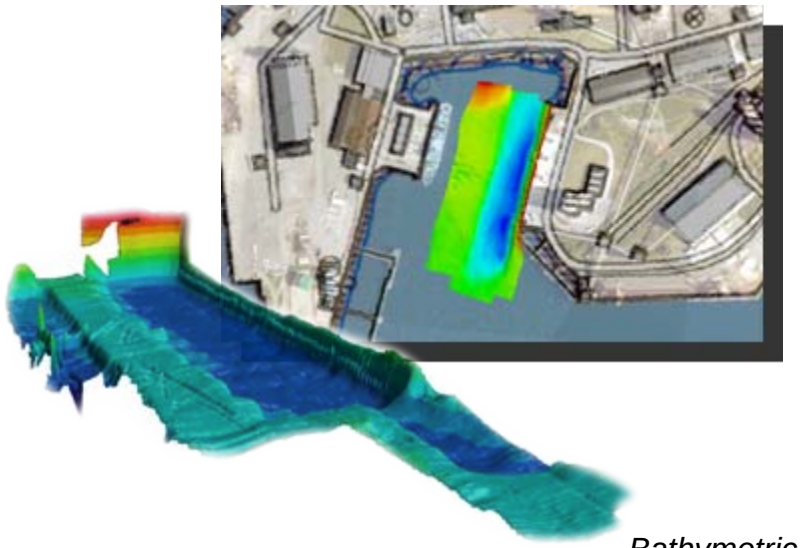
Tasked to survey small areas of BREST harbor

The project is graded with respect to:

- Quality and confidence results
- Methodology
- Project management
- Communication

Three different systems:

- SBES (or mechanical profiler)
- MBES
- Side scan sonar



Bathymetric Digital Terrain Model: Basin #6 in Brest harbor

Practicals

The **Summer Internship**

Repartition of the students for the 2008-2009 series

Survey companies:
10 students

Dredging companies:
9 students

Hydrographic offices:
6 students

University of oceanographic labs:
5 students

In a foreign organization

- Dredging company
- Survey company
- Hydrographic service

This period must include at least:

- 3 weeks at sea work
- 5 weeks at office work
- Minimum duration: two months

Students must:

- Deliver a written report
- Perform a project defense

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Aims of the new training course

Survey systems

Inertial measurements

Mechanical integration

Acquisition devices and software

Data processing and visualization tools

Acoustics

Positioning

MANY DIFFERENT TECHNOLOGIES

Hydrographic data

Gathering

Processing

Analyzing

WIDE VARIETY OF SKILLS

Physics

Applied mathematics

Information technologies

Cat. A level

Aiming at taking the **responsibility** of a complete survey work

Being reactive

Autonomous

Complex and changing environment

Planning survey with minimum quality requirement

Data quality Assessment

Marine institutes

Developers of hydrographic systems and tools

Industry

INTERACTIONS

To deliver a complete education in a complex field

Analysis

Progressive practical training based on:

Alternating practical with theoretical course modules

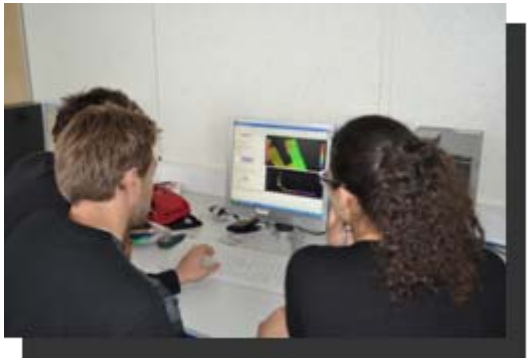
→ to develop their ability to think independently

Alternating training periods within the industry with academic education

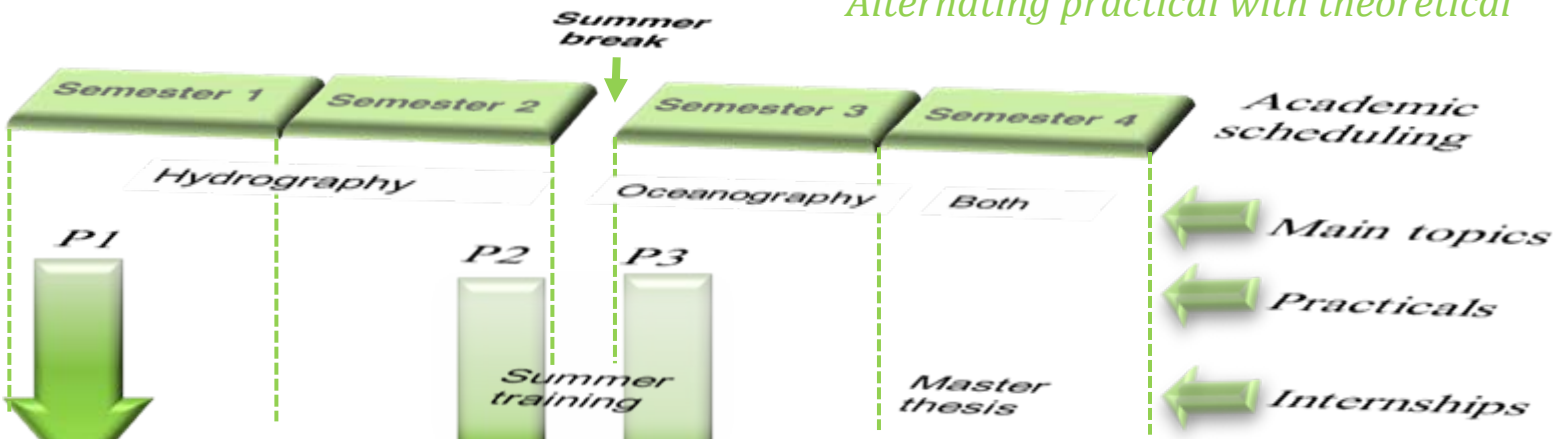
→ to discover other point of views or methodologies

Performing a master thesis in focusing on a scientific subject related to hydrography

→ to initiate them to applied research which can be very helpful for their future adaptation to new technologies.



Alternating practical with theoretical



- At sea working before completing education

patch test

single beam profiling sonar

Scilab

survey project

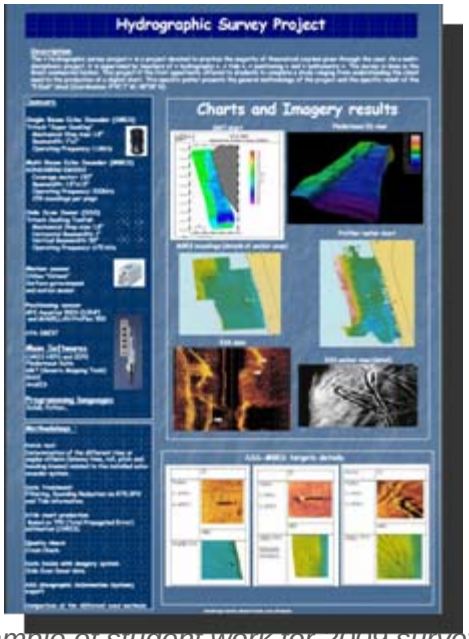
MBES

Systematic errors

Data cleaning

pre-dredging survey

Students are asked to perform the survey from A to Z



An example of student work for 2009 survey project session

CONCLUSION:

- Close cooperation with both survey industries and hydrographic equipment and software companies
- Necessity of wide and deep scientific knowledge for hydrographic surveyors (quality assessment skills, more and more complex tools)
- Students have to learn how to think independently in a survey context
- Good feedback from the industry: 100% employment rate just after graduation