ENGINEERING PROGRAMME

2024-2025

Year 2 / Year 3

Specialisation option

Ocean: Hydrodynamics and Marine Engineering

OD OCEAN

PROGRAMME SUPERVISOR
Lionel GENTAZ

ENGINEERING - OD OCEAN

Autumn Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 73	12	Core course	ENVMA HNUM1 INTHY TEMER	Marine environment and hydrodynamic loads Numerical hydrodynamics: part 1 Introduction to hydrodynamics Seakeeping and stability
UE 74	13	Core course	HNUM2 HYDEX MANCR P1OCEAN PRPOR	Numerical hydrodynamics: part 2 Experimental Hydrodynamics Ship manoeuvrability and moorings Project: part 1 Lifting bodies & propulsion

Spring Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 83	14	Core course	APPRO CONAV EOLIEN INTFS P2OCEAN	Advanced hydrodynamics Shipbuilding and maritime economy Offshore Wind Energy Fluid-structure interaction Project: part 2

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

Marine environment and hydrodynamic loads [ENVMA]

LEAD PROFESSOR(S): Guillaume DUCROZET

Requirements

EI1 - Physique et dynamique des fluides
OD Océan - Introduction à l'Hydrodynamique

Objectives

This course presents classical models used to model surface waves, with specific attention paid to hypothesis and limits of each of the models for hydrodynamic and ocean engineering. The extension to real sea states is presented with an introduction to hindcast models. The response (movement, loading etc) of marine structures to these wave fields is also studied. Finally, the analysis of extreme waves and/or extreme responses is introduced.

After completing the course, students will be able to:
- Identify the wave theory adequate to model a given regular wave.
- Describe in detail the physics of dispersive waves.
- Develop or use numerical models for the wave propagation.
- Interpret and use Metocean data in the context of ocean engineering.

Course contents

Introduction
Gravity waves
- General equations - multiple scales
- Dispersive waves
  o Linear (Airy Wave)
  o Non-linar models (Stokes, stream function, etc)
  o Refraction of gravity waves
- Non-dispersive waves (shallow water)
  o Boussinesq equations
  o Solitary wave
  o KdV equation; cnoidal wave
Statistical models
- Irregular wave fields modeling
- Usual wave spectra
- Generation and propagation of sea states on a large scale
Loadings and response
- Loadings on small bodies
- Response of large bodies to real sea states
Design methodologies for marine structures
- Evaluation of extreme responses and contribution to fatigue in one specific sea state (short-term statistics)
- Evaluation of extreme responses and fatigue assessment over the lifetime of a marine structure (long-term statistics)

Course material

Water wave mechanics for engineers and scientists, Robert G. Dean & Robert A. Dalrymple, Advanced Series on Ocean Engineering (vol.2)

Water waves and ship hydrodynamics: an introduction, A.J. Hermans

Theory and application of ocean surface waves, C.C. Mei, M. Stiassnie & D.K.P. Yue, Advanced Series on Ocean Engineering (vol.23). Part I: Linear aspects; Part II: Non-linear aspects

Assessment

Collective assessment: EVC 1 (coefficient 0.5)

Individual assessment: EVI 1 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	16 hrs	14 hrs	0 hrs	0 hrs	2 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

Numerical hydrodynamics: part 1 [HNUM1]

LEAD PROFESSOR(S): Lionel GENTAZ

Requirements

FLUID (EI1)
INTHY
ENVMA
TEMER

Objectives

The first part of the course deals with numerical panel methods (or BEM for Boundary Element Methods) based on potential flow model. Flows generated by singularities and integral equations are first introduced; then Fredholm equations are obtained and discretised. These methods are applied in the case of ship resistance problems. Lab work covers the implementation of a panel method in a basic case and use of ship resistance solvers based on potential flow model.

The second part focuses on the introduction of finite difference schemes to discretise and solve partial derivative problems. In lab work the problem of a laminar boundary flow on a flat plate is solved by students who have to implement a numerical solver based on finite difference schemes.

Course contents

Panel methods
- potential flow model
- elementary singularities: source, sink, dipole, vortex
- continuous distribution of singularities
- integral equations
- Fredholm equation
- discretisation and numerical solution: panel method
- how to take influence of free surface into account?

Ship resistance
- Froude hypothesis; decomposition of the total ship drag
- numerical treatment using panel method
- examples of results given by panel methods: advantages and limitations

Finite difference schemes
- definition of finite difference schemes
- definition of consistency, stability, convergence
- influence of schemes (centered or non-centered) on stability
- generalisation to discretization of Navier-Stokes equations

Course material

V. Bertram, Practical Ship Hydrodynamics, 2000

G. Delhommeau, les problèmes de diffraction-radiation et de résistance de vagues: étude théorique et résolution numérique par la méthode des singularités, 1987

J.H. Ferziger & M. Peric, Computational Methods for Fluid Dynamics, Ed. Springer, ISBN 978-3-540-42074-3, 2002

Assessment

Collective assessment: EVC 1 (coefficient 0.6)

Individual assessment: EVI 1 (coefficient 0.4)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	8 hrs	16 hrs	6 hrs	0 hrs	2 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

Introduction to hydrodynamics [INTHY]

LEAD PROFESSOR(S): David LE TOUZÉ

Requirements

Fluid mechanics course. For instance the course on Physics and dynamics of fluids (FLUID) of the first year of the French Centrale Nantes engineering programme.

Objectives

This introduction aims at:
- giving elements on the main problems of marine engineering hydrodynamics, related tests in basins and related numerical simulation,
- providing refreshers on fluid mechanics and solid mechanics, useful for understanding the behavior of marine structures,
- presenting the modeling elements that will be used throughout the year in the different courses offered.

Course contents

- Industrial and research themes concerned with hydrodynamics and ocean engineering; hydrodynamic loadings and behavior of floating structures subjected to these loadings; introduction to experimental hydrodynamics and visit to the LHEEA basins of Centrale Nantes
- Classes of flow modeling in hydrodynamics: main kinds of free-surface hydrodynamic problems; Navier-Stokes equations and free-surface boundary conditions; Euler equations, potential flow model; which flow modeling should be used for which marine engineering hydrodynamic problem
- Introduction to boundary layer and turbulence: order of magnitude analysis of Navier-Stokes equations; concept of boundary layer and characteristic scales; laminar and turbulent boundary layer theories; statistical approach of turbulence; wall turbulent flow
- Introduction to numerical simulation: methodology for numerically simulating a physical problem; specificities of the numerical simulation in marine engineering hydrodynamics; connections between problems and methods; elements on meshing, solving, pre- and post-processing, software/hardware links

Course material

Molin B., Offshore Structure Hydrodynamics. Cambridge University Press, 2023.
Faltinsen O., Sea loads on ships and offshore structures. Cambridge University Press, 1990.

Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	24 hrs	6 hrs	0 hrs	0 hrs	2 hrs

Seakeeping and stability [TEMER]

LEAD PROFESSOR(S): Vincent LEROY

Requirements

Mathematics
Fluid Mechanics
Water Waves and Sea-States Modelling

Objectives

This course is divided into two parts:
The first part deals with the behavior of marine structures in waves as a part of the linearized theory of fluid-structure interactions using deterministic approaches. Frequency and time approaches are discussed. Moreover, the fundamental relationships between these solutions are systematically underlined. The effects of the second order low and high frequency effects are also covered. A linearized radiation-diffraction computer code is used in a practical exercise dedicated to the wave-induced motion of a floating wind turbine

In the second part which addresses ship stability, general ship aspects are presented and intact and damaged stability are investigated. Computer lab work is completed using state of the art industry software.

Course contents

Wave-Structure Interation

- Objectives, theoretical framework
- Short review of linear systems theory
- Slender Bodies theory
- Formulation of the boundary value problem. Linearization
- Frequency domain approach
- Time domain approach
- Second order effects

Ship stability

- Properties and equilibrium of a floating body
- Motions of the floating body
- Specific problems of stability
- Transversal angles
- Regulation calculations of stability

Lab work is proposed using a state of the art industry software to solve ship stability.

Course material

Molin, B. (2023). Offshore structure hydrodynamics. Cambridge University Press.

Molin, B. (2002). Hydrodynamique des structures offshores. Editions TECHNIP.

J.N. Newman (1977). Marine Hydrodynamics. MIT Press.

O.M. Faltinsen (1990). Sea Loads on Ships and Offshore Structures, Cambridge University Press.

1991. Statique des corps flottants. cours ENSM

R. Servières (1992). Théorie du navire. ENSTA

R. Hervieu (1985). Statique du navire. Éditions Masson, Paris,

Résolution A.749 : code on intact stability for all types of ship covered by IMO instruments

Chapitres II-1 de la SOLAS : convention internationale de 1974 sur la sauvegarde de la vie humaine en mer, à jour des amendements en vigueur)

Assessment

Collective assessment: EVC 1 (coefficient 0.6)

Individual assessment: EVI 1 (coefficient 0.4)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	18 hrs	10 hrs	4 hrs	0 hrs	2 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

Numerical hydrodynamics: part 2 [HNUM2]

LEAD PROFESSOR(S): Zhe LI

Requirements

Objectives

This course covers the study of the numerical simulation of viscous flows modeled by Navier-Stokes equations and especially Reynolds Averaged Navier-Stokes Equations (RANS Equations).
Turbulence modelling, state of the art of hydrodynamic problems solved by Navier-Stokes solvers in industry, velocity-pressure coupling, treatment of the free surface, methods used to solve large ans sparse linear systems and introduction to discretisation of partial derivative equations by Finite Volume schemes are investigated.

During lab work the Navier-Stokes solver Star-CCM+ is used by students for academic cases: lid-driven cavity problem, Poiseuille flow, turbulent flow over periodic hills. The Navier-Stokes solver Fine-Marine is used for the simulation of the flow around a ship with forward speed in calm water.

Course contents

- turbulence modelling (Reynolds Averaged Navier-Stokes Equations, Large Eddy Simulation, Direct Numerical Simulation)
- state of the art of use of Navier-Stokes solvers for problems treated by companies working in naval engineering or ocean engineering
- velocity-pressure coupling (leading to weakly-coupled or fully-coupled algorithms)
- free surface modelling (free surface tracking or free surface capturing procedures)
- iterative methods to solve large and sparse linear systems obtained by discretisation of Navier-Stokes equations using Finite difference or Finite Volume schemes
- introduction to Finite Volume schemes for discretization of Navier-Stokes equations

Course material

J.H. Ferziger, M. Peric, Computational Methods for Fluid Dynamics, Springer

Assessment

Collective assessment: EVC 1 (coefficient 0.6)

Individual assessment: EVI 1 (coefficient 0.4)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	12 hrs	6 hrs	0 hrs	2 hrs

Experimental Hydrodynamics [HYDEX]

LEAD PROFESSOR(S): Félicien BONNEFOY

Requirements

Fluid Mechanics - FLUID
Marine Environnement - ENVMA
Sea-keeping - TEMER

Objectives

This course presents state-of-the-art experimental techniques for naval and offshore hydrodynamics. Experiments in the school's wave and towing tanks, are used as examples.
Ship resistance, self-propulsion tests, manoeuvrability, environmental condition generation (wave, current and wind) are typical topics addressed during the course.

Course contents

The different aspects of the course are illustrated in tutorial exercises (wave specific signal processing) and practical work (week in the experimental facilities of the LHEEA Lab).

Four experimental lab sessions are included among:
- ship resistance in the towing tank
- seakeeping in deep water
- ship stability
- propeller open water tests
Two other labworks are no longer done due to a reduction of funding
- seakeeping in finite depth (small wave tank)
- turbulent boundary layer

Course material

B. Molin, 2002, Hydrodynamique des structures offshore, Editions Technip
S.A. Hughes, 1995, Physical models and laboratory techniques in coastal engineering, Advanced series on ocean engineering, Vol. 7
N. Newman, Marine Hydrodynamics
O.M. Faltinsen, Sea loads on ships and offshore structures
V. Bertram, Practical Hydrodynamics
S. Chakrabarti, Offshore structure modelling

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	8 hrs	2 hrs	22 hrs	0 hrs	0 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

Ship manoeuvrability and moorings [MANCR]

LEAD PROFESSOR(S): Félicien BONNEFOY

Requirements

Fluid Mechanics - FLUID
Marine Environment - ENVMA
Sea-Keeping and Stability - TEMER

Objectives

This course is divided into two parts:
The first part deals with the manoeuvrability of ships or other floating structures, and modelling and applications related to this issue.
The second part covers the main characteristics of moorings used in marine and offshore engineering. Practical application involves using industrial calculation software.

Course contents

With regard to manoeuvrability, the basic formulation is presented in a modular approach. Experimental and numerical techniques for hydrodynamic model design are given.

With regard to moorings, the necessity of moorings in marine engineering is outlined. The main characteristics of moorings are presented with their associated benefits and drawbacks. State-of-the-art industry software is used for an offshore floating structure with moorings subject to swell and currents so that motions of the structure, load on moorings etc can be evaluated and analysed.

Course material

E.M. Lewandowski, 2004, The dynamics of marine crafts: manoeuvring and seakeeping, Advanced series on ocean engineering, Vol. 22, World Scientific

V. Bertram, 2000, Practical Ship Hydrodynamics, Butterworth Heinemann

T.I. Fossen, 2011, Handbook of marine craft hydrodynamics and motion control, Wiley

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	16 hrs	6 hrs	0 hrs	0 hrs

Project: part 1 [P1OCEAN]

LEAD PROFESSOR(S): Lionel GENTAZ

Requirements

FLUID, Physics of Fluids and Fluid Dynamics (EI1)
All lectures proposed in OD OCEAN

Objectives

This course is the first part of the 80 hour project conducted across the two semesters.
The purpose is to use skills acquired during the Ocean specialisation for practical projects proposed and supervised by Centrale Nantes professors and researchers by or engineers from companies.
Students work in teams of 2 to 3 during this project.

Course contents

Students select their subject in October.
Teams of students work on their subject until January during sessions which are planned in the specialisation's timetable.
A presentation of their work is planned at the end of January.

Course material

All documents proposed in the different courses of the specialisation.

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	1	0 hrs	0 hrs	0 hrs	32 hrs	0 hrs

Lifting bodies & propulsion [PRPOR]

LEAD PROFESSOR(S): Antoine DUCOIN

Requirements

Objectives

The objective of this course is to provide the fundamentals on methods and physics in order to predict hydrodynamic performance and help in the design of lifting bodies. A large range of methods will be presented based on both potential and viscous flows, and some applications will be covered.

The propulsion class will be helpful to define the main characteristics of propellers, to study the performance, sizing and their applications.

Course contents

Lifting profile:

Lectures
1- Introduction: Geometrical parameters, physical parameters, similarity parameters, classification of flows
2 - Flow and performance analysis
3/4 - Potential methods: thin profile theory and lifting line theory

Tutorial: application of the thin profile theory

Lab work: application of the lifting line theory using Matlab - study of viscous and thickness effects using Xfoil

Course material

Assessment

Collective assessment: EVC 1 (coefficient 0.6)

Individual assessment: EVI 1 (coefficient 0.4)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	14 hrs	16 hrs	0 hrs	0 hrs	2 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

Advanced hydrodynamics [APPRO]

LEAD PROFESSOR(S): Zhe LI

Requirements

Objectives

This course goes into depth on different aspects, relying on elements studied in previous courses:

Part 1 - Multi-objective optimization applied to marine hydrodynamics

Part 2 - Future trends of current numerical methods and emerging methods

Part 3 - Introduction to sailboat dynamics

Course contents

Part 1 Optimization:
- Presentation of the main optimization algorithms (gradient, genetic, etc.)
- Lab work with use of optimization software: tests of efficiency of the optimization algorithms for a known function; practical case consisting in the optimization of a ship bulbous bow in order to reduce ship resistance.

Part 2 - Future of numerical methods:
- State-of-the-art and future trends of numerical methods applied to free-surface hydrodynamics
- Emerging methods: Finite Volumes (high order and adaptive mesh refinement), Finite Elements, Lattice-Boltzmann Method, Smoothed Particle Hydrodynamics (SPH)
- Case of the SPH method, appropriate for fast dynamics problems (impacts, slamming, wave breaking)
- Lab work with use of SPH software

Part 3 - Introduction to sailboat dynamics:
- Review of loads acting on a sailing boat and study of its equilibrium
- Basics of naval architecture
- Specificities of the ship project for sailing boats
- Visit of a repair shipyard

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	16 hrs	10 hrs	6 hrs	0 hrs	0 hrs

Shipbuilding and maritime economy [CONAV]

LEAD PROFESSOR(S): Lionel GENTAZ

Requirements

TEMER (ship stability)

Objectives

This course is devoted to an introduction to shipbuilding and to the basic principles of the projet in ship design.
A focus is made on onboard energy, propulsion and structure of the ship

In lab work students have to complete a short design loop.

Conferences are proposed to give an overview on shipping decarbonization and especially on the wind assisted ship propulsion.

Course contents

Shipbuilding
- management of ship projects :
  categories of ships
  ship design loop
  elements of building of ships

- energy on board :
  production of energy and examples

- ship propulsion :
  decomposition of ship resistance
  usual propulsion by propeller
  other propulsors used in shipbuilding

- ship structure :
  definitions
  resistance of materials
  calculation of needed structures based on local and global stresses

- conferences on:
  the shipping decarbonization
  last developments of the wind assisted ship propulsion

Course material

Goulet, J, Boutin, J-P, Lerouge, F. Aide-mémoire de résistance des matériaux, éditions Dunod
Delaplace, A, Gatuingt, F, Ragueneau, F. Mécanique des structures-résistance des matériaux, éditions Dunod
Latteur, P. Calculer une structure, de la théorie à l'exemple, éditions Académia

Assessment

Collective assessment:	EVC 1 (coefficient 0.5)

Individual assessment: EVI 1 (coefficient 0.5)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	18 hrs	2 hrs	8 hrs	0 hrs	2 hrs

Offshore Wind Energy [EOLIEN]

LEAD PROFESSOR(S): Vincent LEROY

Requirements

Lifting profiles
Water Wave and Sea-States Modelling
Wave-Structure Interaction

Objectives

- Know the current deployment of onshore and offshore wind energy and the challenges for the future deployments.
- Acquire a good understanding of the wind turbines operation
- Assess performances of single wind turbines or wind farms
- Know the theories and methods related to the floating wind turbine modelling
- Experiment the specific design of floating wind turbines

Course contents

- Wind resource, potential of installation and wind installed capacity in Europe and in the world. Environmental impacts, economical aspects and costs of wind farm projects
- Wind turbine components and general principles of wind turbine operation (rotor, drive-train, generator...)
- Electricity production and farm effects
- Specificities of offshore wind. Types of bottom-fixed and floating foundations
- Dynamic analysis of a floating wind turbine

Some numerical tutorials will be performed to learn how to design a horizontal-axis wind turbine, to assess the wind turbine production and the farm effects, to design floaters and to deal with their coupling with the wind turbines.

Course material

Introduction to wind energy systems 2013, Springer-Verlag Berlin and Heidelberg GmbH & Co. K

Wind Energy Handbook, 2001 John Wiley & Sons, Ltd

Wind energy explained , - Theory, Design and Application. 2009 John Wiley & Sons, Ltd

Wind resource assessment - A practical guide to developing a wind project. 2012 John Wiley & Sons, Ltd

Assessment

Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	20 hrs	2 hrs	0 hrs	0 hrs

Fluid-structure interaction [INTFS]

LEAD PROFESSOR(S): Antoine DUCOIN

Requirements

Objectives

Part 1- Fundamentals of fluid structrure interaction (Antoine Ducoin)

The purpose is to present fundamental aspects for modelling and solving problems of fluid-structure interactions in marine engineering. The different parts cover:

a) Outline of the different types of fluid structure interaction phenomena
-Theory: equilibrium at the fluid structure interface, effect of added mass and stiffness and damping, scaling of a fluid structure interaction problem
-Study of flow induced vibration problems through simple models:
 i) flow around a flexible cylinder (forced and free motions), resonance phenomenon
 ii) flexible lifting profile: study of static divergence and flutter with potential flow theory
 iii) numerical methods in fluid structure interaction: coupling algorithm (space/time, staggered/monolithic etc), algoritms used to deform the mesh, ALE formulation.

Lab work: simulation of a blade deformation using STARCCM+, structural instability analysis

Part 2 - Ship vibrations (Hervé LeSourne)
The objective of these lectures is to provide the fundamentals for an engineer to calculate the vibratory response of a ship.

Course contents

Part I.
Lecture 1: Introduction and non dimensional analysis
Lecture 2: Flow induced vibration
Lecture 3: Numerical methods

Part 2:
Lecture 1: Ship vibration

Course material

Assessment

Collective assessment: EVC 1 (coefficient 0.6)

Individual assessment: EVI 1 (coefficient 0.4)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	18 hrs	8 hrs	4 hrs	0 hrs	2 hrs

ENGINEERING - OD OCEAN

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

Project: part 2 [P2OCEAN]

LEAD PROFESSOR(S): Lionel GENTAZ

Requirements

FLUID, Physics of Fluids and Fluid Dynamics (EI1)
All lectures proposed in OD OCEAN

Objectives

P2OCEAN is the second part of the project (after the first part done in P1OCEAN). Both parts are dedicated to the same project.
The purpose of this course is to use the skills acquired during the Ocean specialisation for practical projects proposed and supervised by Centrale Nantes professors and researchers or engineers from companies.
During the project, students work in teams of 2 or 3 people.

Course contents

Teams of students can work on their project and interact with their supervisors during sessions which are planned in the timetable.
A final project presentation is organized at the end of March.

Course material

all documents and books proposed by the lecturers in the different courses of the Ocean specialisation.

Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	2	0 hrs	0 hrs	0 hrs	48 hrs	0 hrs