M1 PROGRAM DESCRIPTION
Master in Civil Engineering
Hydraulics and Civil Engineering

International Program

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M1 PROGRAM DESCRIPTION

Semester 1

Sept. 2016 - Jan. 2017

7 compulsory modules

Semester 2

Feb. 2017 – Jul. 2017

5 compulsory modules
8 weeks Internship

M2 HCE

SEMESTER 1
30 ECTS, 300 Teaching Hours

7 compulsory modules

1/ SCIENTIFIC COURSE FOR NEWCOMERS
1 ETCS, 10h

2/ APPLIED STRUCTURAL ANALYSIS
3 ETCS, 32h

3/ CONTINUUM MECHANICS AND FINITE ELEMENT MODELING
6 ETCS, 60h

4/ FRENCH AS A FOREIGN LANGUAGE
2 ETCS, 20h

5/ ENGINEERING HYDROLOGY
6 ETCS, 60h

6/ MATERIALS AND STRUCTURES
6 ETCS, 60h

7/ PRESSURIZED FLOW HYDRAULICS
6 ETCS, 60h

SEMESTER 1
Compulsory modules description

1/ SCIENTIFIC COURSE FOR NEWCOMERS

1 ETCS, 10h

Tutorial classes	10h

Module leader
Dr. Bruno CHAREYRE

2/ APPLIED STRUCTURAL ANALYSIS

3 ETCS, 32h

Engineering work	32h

Module leader
Dr. Ludovic MISSEMER

Objectives and content

- to acquire independency in the study of a global structure
- to apply the parallel theory of courses on this structure
- to design parts of the structure in conditions close to an engineer office

The subject deals with a dam on river which is replaced by a new technology of dam. The students study the civil engineering aspects of the projects such as strength of materials, hydraulic leaks, steel conception, reinforced concrete design.
In order to achieve the different objectives, theorical aspects are developed during the session or for other aspects, students have to find information and data by themselves.

SEMESTER 1
Compulsory modules description

3/ CONTINUUM MECHANICS AND FINITE ELEMENT MODELING

6 ETCS, 60h

Module leader

Prof. Gaël COMBE

Lecture courses	22h
Tutorial classes	24h
Engineering work	10h
Practicals	4h
Exams	*3h*
Optional learning support	*20h*

Objectives and content

First part : Continuum Mechanics (Prof. G.Combe)

- Continuum description of solids and strain-stress description

Second part : Basis of the FEM approach (Prof. B. Loret)

- Understand the methods of quantification and solving equations of solid mechanics
- Know how to isolate a structure and define its boundary conditions
- Know how to implement and configure a simulation, validate and analyze the results

This module prepares for simulating mechanical problems (solid) on which the body geometry which may be complex and the physical properties can be spatially varied.

SEMESTER 1
Compulsory modules description

4/ FRENCH AS A FOREIGN LANGUAGE (FLE)

2 ETCS, 20h

Lecture courses	20h

Module leader

Ing. Antoine LE GRAND

Obectives and content

During 10 weeks, 2 hours of FLE per weeks
Grade level small group

SEMESTER 1
Compulsory modules description

5/ ENGINEERING HYDROLOGY

6 ETCS, 60h

Lecture courses	28h
Tutorial classes	14h
Engineering work	18h
Exams	*3h*
Optional learning support	*6h*

Module leader
Dr. Isabella ZIN

Objectives and content

- To learn the principles of data analysis and data screening in hydrology.
- To acquire the necessary concepts for the design of hydraulic works aimed either at risk protection against floods or droughts, or at water resources storage and management.
- To master the necessary steps to reproduce the hydrological behaviour of a natural or urbanized watershed by choosing the most appropriate tools.

1. Engineering hydrology : water cycle, hydrological budget and hydrological regimes. Elements of metrology. Runoff generation: loss or production function and Unit Hydrograph or transfer function approach.
2. Statistical hydrology : basics of statistics for hydrology, model fitting techniques on a data sample and hypothesis testing. Stochastic relations between variables: simple and multiple linear correlation. Data screening and error detection.
3. Hydrological prediction and hydraulic works design : return period, design rainfall and design discharge. Main methods for extreme events prediction and for hydrological design at different scales: hydraulic works, natural watersheds, urban and anthropic watershed.
4. Hydrological modelling : main types of existing hydrological models and modeling steps.

A global project-based learning assignment will be devoted to synthesize and link the themes provided by this module.

SEMESTER 1
Compulsory modules description

6/ MATERIALS AND STRUCTURES

6 ETCS, 60h

Module leader
Dr. Ludovic MISSEMER

Lecture courses	24h
Tutorial classes	24h
Engineering work	12h
Exams	*2h*
Optional learning support	*20h*

Objectives and content

- To present the basics of the mechanical behaviour depending on the time with an application to the concrete
- To use practically the notions of elasticity learnt in the first year class
- To be able to design at limit states elements in reinforced concrete under simple sollicitations (beam under bending moment, column in compression, compounded flexion)
- To understand the basis of reinforced concrete
- To take in hand a finite elements software in order to analyze structures in elasticity (beam, slab, dam)

Civil engineering structures are mainly built in reinforced/prestressed concrete. This module wants to instruct students to the basics of structures design under various sollicitations, leaned on notions of limit states presented in the Eurocode 2 (course 1). The constitutive behaviour to design these elements leaned on the viscoelasticity lesson (course 2). This course enables to characterize and to formalize the behaviours of aging and non aging material by using simple models (spring, absorbe, pad). The whole notions is applied through an experimental practice on elasticity, a modelisation structure project and a project on the long term behaviour of concrete and its rheological modelisation.

SEMESTER 1
Compulsory modules description

7/ PRESSURIZED FLOW HYDRAULICS

6 ETCS, 60 h

Module leader
Prof. Regiane FORTES PATELLA

Lecture courses	26h
Engineering work	12h
Practicals	16h
Exams	*3h*
Optional learning support	*10h*

Objectives and content

- Application of integral relations (conservation of mass, momentum, and moment of momentum, generalised Bernoulli) to real applications
- Basic knowledge of calculations for pipe networks
- Basic knowledge of hydraulic machines: operation and inner workings
- Analysis of transient conduit flow: pressure fluctuations and water hammer

In the first part, the course presents practical approaches of the fluid mechanics conservation equations. It introduces some methods to treat pipes networks problems and trains students to solve industrial problems related to hydraulic machineries. The second part of the course presents the theory of the transient hydraulic regimes. It sensitizes students to the problems of hydraulic instabilities and related issues.

SEMESTER 2
30 ECTS, 300 Teaching Hours

5 compulsory modules

1/ FREE SURFACE HYDRAULICS
6 ETCS, 60h

2/ GROUND HYDRAULICS AND HYDRAULICS WORKS
5 ETCS, 54h

3/ SOIL AND ROCK MECHANICS
6 ETCS, 60h

4/ TEAM PROJECT
6 ETCS, 60h

5/ FRENCH AS A FOREIGN LANGUAGE
2 ETCS, 20h