الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic Republic of Algeria
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research

جامعة محمد خيضر
بسكرة
Mohamed Khider University of Biskra

# TRAINING OFFER
# MASTERPROFESSIONALIZER

# 2022 - 2023

| Establishment | Faculty / Institute | Department |
|---|---|---|
| **Mohamed Khider University of Biskra** | **Faculty of Science and Technology** | **Civil and Hydraulic Engineering** |

| Domain | Sector | Speciality |
|---|---|---|
| **Science And Technologies** | **Hydraulic** | **Management and Engineering of Water and Sanitation Services** |

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اللجنة البيداغوجية الوطنية لميدان العلوم و التكنولوجيا

National Educational Committee for the Field of Science and Technology

# عرض تكوين
# ماستر مهني

## 2023-2022

| المؤسسة | الكلية/ المعهد | القسم |
|---|---|---|
| جامعة محمد خيضر بسكرة | كلية العلوم والتكنولوجيا | الهندسة المدنية والري |

| الميدان | الفرع | التخصص |
|---|---|---|
| علوم وتكنولوجيا | الري | تسيير وهندسة خدمات المياه والتطهير |

# Summary

**(CPND)**

# I–Master’s identity sheet

## 1 - Location of the training

**Department: Civil and hydraulic engineering**
**Faculty (or Institute): Faculty of Science and Technology**
**Mohammed Khider University of Biskra**

## 2-External partners

**Businesses and other socio-economic partners:**

- Algerian Waters (ADE) Biskra Unit;
- National Sanitation Office (ONA) Biskra Unit;
- Directorate of Wilaya Water Resources (DRE)from Biskra;
- Biskra Environment Directorate.
- The National Agency for Dams and Transfers ANBT

## 3– Context and objectives of the training

## A- Access conditions

The access conditions for this professional Master's training are defined as follows:
**Category 1:**Admission to the first semester of the Master course (MP1)

- On file for candidates holding a Bachelor's degree in: urban hydraulics, water resources management, Hydraulics or an equivalent diploma.

**Category 2:**Admission to the first semester of the Master course (MP2)
Are authorized to submit application files:

- Engineers from the old (classical) system in: hydraulics, urban hydraulics or holders of a recognized equivalent diploma.

The selection of candidates will be made by an admission jury within the limits of available places, this jury – composed of teachers of the Hydraulics sector of the Department of Civil Engineering and Hydraulics – will be responsible for setting for each accepted student , the subjects and modules validated according to its course and its preliminary results and will define its path to the professional Master in the specialty concerned, possibly including additional pre-required subjects. In all cases, validation of previous training is subject to the approval of the training team.

## B – Training objectives

In order to respond, with the greatest efficiency, to the requirements of socio-economic partners, the university is a melting pot of knowledge capable of ensuring mastery of a growing technology and caring about the country's place in the world. new local and global science and technology map.
The opening ofProfessional Master in “Management and engineering of AEP and Sanitation services” aims to train high-level specialists in the field of urban hydraulics, on behalf of the private and public sector. Therefore, this training aims to equip applicants with:

- Theoretical and practical knowledge, sufficient and adequate to better ensure their successful integration into professions in the field of design and diagnosis of AEP and Sanitation systems;
- An integrated vision of modeling and leak detection techniques and technologies;
- A good command of metrology and therefore the operation of urban water systems;
- A good command of project and business management as well as business creation working in the water resources sector.

## C – Profiles and targeted skills

The program is characterized by an effective presence of the essential subjects for theoretical and practical training and allows the acquisition of the fundamental scientific bases necessary for adequate specialization. The targeted skills:

- Human-social: listening and communication, spirit of initiative;
- Techniques: mastery of editorial techniques (response to calls for tender, study report, articles), mastery of field and laboratory operations (design and implementation), mastery of data analysis tools (databases , geographic information system, modeling, statistical analyses, etc.);
- Legal: mastery of the regulatory framework
- The department aims to train executives who master the problems:
- Design of urban water networks;
- Diagnosis and modeling of AEP and Sanitation systems;

## D - National employability potential

The strong economic growth and activity in the water sectors (domestic, agricultural and industrial) leads us to expect an increase in hiring in these sectors and consequently job opportunities for students of this professional Master's degree.

This training project meets the needs of the job market in the field of protection and management of water resources, water quality, production and distribution of drinking water, collection, treatment and fate of wastewater.

Master's degree students (**Management and Engineering of Water and Sanitation Services)**will be able to apply to the organizations responsible for the management of urban water networks (ADE & ONA), design offices, wilayat hydraulic directorates (DHW), watershed agencies (ABH), companies hydraulic works and finally the works control bodies (CTH & CTC).

The professional master (**Management and Engineering of Water and Sanitation Services)**prepares the following professions:

1. Water and environment project manager in industrial groups
2. Water and environment project manager in local authorities
3. Director / head of water service
4. Director of a design office or a branch of design offices specializing in water and liquid waste management
5. Senior executive operating sanitation networks and/or wastewater treatment plants.
6. Water analysis laboratory manager.

7. Responsible for water quality management services in communities or public or private companies, or water management organizations (ANRH, ABH, ONA, ADE, SEAL, SEACO, etc.)
8. Creation of micro-enterprises.

## E – Gateway to other specialties:

The vertical gateway from the academic degree (Hydraulics) to the master's degree**(Management and Engineering of Water and Sanitation Services)**will be open to students. The selection of students will be made based on file review by the training team concerned.

## F – Performance indicators expected from the training:

The teaching offered as part of the Master's degree is organized over a period of four semesters. THEThe fourth semester is reserved for the completion of the end-of-study dissertation.(Project Graduation).
Student evaluation is based on a continuous evaluation system (Individual and collective work)followed by an exam and a make-up exam for students who have not completed 30 credits for each semester.
The specialty brings together a coherent choice of teaching units (EU) which makes it possible to give the diploma a specific authorized designation. This course allows students to build a mosaic of training in urban hydraulics and the development of AEP and sanitation systems.

- Diploma acquired after four semesters of study after the license;
- Three semesters of applied sciences in hydraulics (AEP, sanitation and water treatment);
- After acquiring scientific assets, the student prepares a written dissertation which he defends before a jury towards the end of June.

**Defense:**

Finally, the final dissertation will be defended before a jury with a view to obtaining the professional Master's degree.**Management and Engineering of Water and Sanitation Services»**

**Language :**

The language of training is French.

## 4 – Human resources available:

**A - Supervision capacity (expressed in number of students that can be supported):**

Number of students:30

**B - Internal teaching team mobilized for the specialty:(To be completed and endorsed by the faculty or institute)**

**C - External teaching team mobilized for the specialty:(To be completed and endorsed by the faculty or institute)**

**D - Overall summary of human resources mobilized for the master's specialty:**

| Grade | Internal Workforce | External Workforce | Total |
|---|---|---|---|
| **Teachers** | **07** | **01** | **08** |
| **Lecturers (A)** | **08** | **01** | **09** |
| **Lecturers (B)** | **--** | -- | **--** |
| **Assistant Master (A)** | **04** | -- | **04** |
| **Assistant Master (B)** | -- | -- | **--** |
| **Other (*)** | -- | **01** | **01** |
| **Total** | **19** | **03** | **22** |

(*) Technical and support staff

## 5 – Material resources specific to the specialty

### A- Educational Laboratories and Equipment:

Sheet of existing educational equipment for the practical work of the planned training (1 sheet per laboratory)

**Laboratory title: Hydraulics**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| **01** | Fundamental Hydrology Study System (Armfield) | **01** | |
| **02** | Hydraulic pump | **01** | |
| **03** | KDG 2000 flow meter | **01** | |
| **04** | Weather station | **01** | |
| **05** | Compact 0.5-50m/s anemometer | **01** | |
| **06** | Compact 0-360° wind sensor | **01** | |
| **07** | Hygrothermometer RH 0-100%.T-20°/-80° | **01** | |
| **08** | Rain gauge | **01** | |
| **09** | Central acquisition | **01** | |
| **10** | 256 KB memory card | **01** | |
| **11** | Reading device | **01** | |
| **12** | Acclomate Battery | **01** | |
| **13** | Accumulator | **01** | |
| **14** | Laminar flow tank (Armfield) | **01** | |
| **15** | Combi 2 curvimeter | **05** | |
| **16** | Turbidimeter 2100P (HACH) | **01** | |
| **17** | Programmable sampler | **01** | |
| **18** | Dryfit accumulator | **01** | |
| **19** | Battery charger | **01** | |
| **20** | Syscal Junior 400 V resistivometer | **01** | |
| **21** | Battery charger | **01** | |
| **22** | PC transfer cable and software | **01** | |
| **23** | Software key | **01** | |
| **24** | Measuring cable 2x0.5 LICY gray | **01** | |
| **25** | Electric pliers | **02** | |

| | | | |
|---|---|---|---|
| **26** | Polarizing microscope | **01** | |
| **27** | Polarizing microscope | **01** | |
| **28** | Stereo binocular magnifier | **01** | |
| **29** | Case for water analysis | **01** | |
| **30** | Conductivity tester | **01** | |
| **31** | Succhi disc | **01** | |
| **32** | Solar calculator | **01** | |

**Laboratory title: Topography**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| **01** | NI40 comparator level | **01** | |
| **02** | NI40 comparator level | **01** | |
| **03** | NI40 comparator level | **01** | |
| **04** | Aluminum tripod | **01** | |
| **05** | Aluminum tripod | **01** | |
| **06** | Aluminum tripod | **01** | |
| **07** | ZEISS Eth50 Theodolite | **01** | |
| **08** | ZEISS Eth50 Theodolite | **01** | |
| **09** | ZEISS Eth50 Theodolite | **01** | |
| **10** | TOPCOM wooden tripod | **01** | |
| **11** | TOPCOM wooden tripod | **01** | |
| **12** | TOPCOM wooden tripod | **01** | |
| **13** | Telescopic aluminum sight, graduated in mm | **01** | |
| **14** | Telescopic aluminum sight, graduated in mm | **01** | |
| **15** | Telescopic aluminum sight, graduated in mm | **05** | |
| **16** | Battery charger for Eth50 | **01** | |
| **17** | Battery charger for Eth50 | **01** | |
| **18** | Battery charger for Eth50 | **01** | |
| **19** | NIKON NE 20S electronic theodolite | **01** | |
| **20** | Laser distance meter (disto-basic) | **01** | |
| **21** | Viewfinder for basic distortion | **01** | |
| **22** | GLSP1 reflector cane | **01** | |
| **23** | 1m extension for GLS11 cane | **01** | |
| **24** | GSR2 double counter plug | **01** | |
| **25** | GLS11 reflector | **02** | |
| **26** | Brown light | **01** | |
| **27** | NICD Battery Charger | **01** | |
| **28** | NEDO invar sight, 5mm, 3m | **01** | |
| **29** | NEDO invar sight, 5mm, 3m | **01** | |
| **30** | NEDO invar sight, 5mm, 3m | **01** | |
| **31** | Optical square, double prism | **10** | |
| **32** | Base, 3kg toad | **03** | |
| **33** | 1m interlocking milestone | **10** | |
| **34** | Milestone tripod | **10** | |

**Laboratory title: Topography laboratory and workshop**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 01 | Topographic devices<br>• Theodolites<br>• levels<br>• Stereoscope | 30 | |
| 02 | WORKSHOP FOR MODELS AND MODELS | 01 | |

**Laboratory title: Water quality and treatment laboratory**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| **01** | Oven | **03** | |
| **02** | Portable turbidimeter | **02** | |
| **03** | Centrifuge | **01** | |
| **04** | Spectrophotometer (325-1000 nm) | **01** | |
| **05** | Two-stage diaphragm pump | **02** | |
| **06** | Rotational viscometer | **03** | |
| **07** | Micro dosing pump (Q3 – 120 ml/min) | **02** | |
| **08** | Mixer for four cylinders (1000 ML) | **01** | |
| **09** | Standard depth sampler (02 l) | **02** | |
| **10** | 12 Station Autosampler (1.8L) | **01** | |
| **11** | Automatic sampler with 24 Stations (01 l) | **01** | |
| **12** | Corrosion tester with Amp/Volt | **01** | |
| **13** | Water demineralizer with cartridge | **02** | |
| **14** | Complete oxidation block (DCO) with tube support | **01** | |
| **15** | pH meter 96-A/SET-1 | **04** | |
| **16** | pH meter OP-211/1 | **02** | |
| **17** | pH meter 3010 (JENWAY) | **05** | |
| **18** | portable pH meter | **01** | |
| **19** | LF 90 conductivity meter (trunk) | **02** | |
| **20** | Conductivity meter LF 96 A/SET-1 (trunk) | **01** | |
| **21** | Conductivity meter LF 521 | **01** | |
| **22** | Conductivity meter type OK-104 (trunk) | **02** | |
| **23** | Oximeter/OXI 96-B/SET (trunk) | **02** | |
| **24** | Oximeter/OXI 92 (trunk) | **02** | |
| **25** | Circulation thermostat 750 Watts | **02** | |
| **26** | Apparatus for measuring light absorption in water | **01** | |
| **27** | Rotary evaporator with bath heater 4.7 l<br>Contact thermometer (0-250°) | **03** | |
| **28** | pyrex water distiller | **03** | |
| **29** | x,y,t recorder | **03** | |
| **30** | Oil pump | **01** | |
| **31** | Lux meter | **02** | |
| **32** | OP 109 type ionometer | **01** | |
| **33** | Ionometer/pH – Rissell model RL 200 | **01** | |
| **34** | Combined oximeter and pH | **01** | |
| **35** | Magnetic stirrers | **01** | |
| **36** | Automatic burette | **02** | |
| **37** | pocket pH meter | **01** | |

| | | | |
|---|---|---|---|
| **38** | Bain Marie | **01** | |
| **39** | Drying lamp | **30** | |
| **40** | Digestion ramp for nitrogen determination (06 vials) | **01** | |
| **41** | Atomic Absorption Spectrophotometer + printer | **01** | |
| **42** | Hotplate | **01** | |
| **43** | Hot air blower | **01** | |
| **44** | Vibrating stirrer | **02** | |
| **45** | Flow meter study system | **01** | |
| **46** | Laboratory timer | **01** | |
| **47** | Crucible tongs | **30** | |
| **48** | Beaker Tongs | **01** | |
| **49** | Stopwatch | **02** | |
| **50** | Flocculator Jar test at 06 Stations (Individual speed) | **02** | |
| **51** | Photometer in case | **01** | |
| **52** | UV/Visible Spectrophotometer | **01** | |
| **53** | WTW LF 315 conductivity meter | **01** | |
| **54** | Filtration ramp | **01** | |
| **55** | C100 multi-parameter photometer | **01** | |
| **56** | 16 Station Mouth Tube COD Reactor | **01** | |
| **57** | P 800 pH meter in case | **01** | |
| **58** | Filtration unit | **02** | |
| **59** | Hydrometer | **01** | |
| **60** | Falling ball viscometer (set of 03 cylinders) | **03** | |
| **61** | Hydraulic benches | **04** | |
| **62** | Parshall Canal | **01** | |
| **63** | Wave generator (10 m channel) | **01** | |
| **64** | Hot wire anemometer study bench | **01** | |
| **65** | Calibration wind tunnel | **01** | |
| **66** | Study bench with Lazer-Dopler function | **01** | |
| **67** | Apparatus for studying free and forced vortices | **01** | |
| **68** | Medium corrosion pumps | **04** | |
| **69** | Fully equipped pump and pumping station + Flowmeter test bench | **01** | |
| **70** | Hydrology study bench | **01** | |
| **71** | Rain simulator | **01** | |
| **72** | Lysimeter | **02** | |
| **73** | Infiltration and drainage study bench | **01** | |
| **74** | Depth moisture meter with neutron probe | **01** | |
| **75** | Recorder | **02** | |
| **76** | Blood pressure monitor | **17** | |
| **77** | Rheological apparatus | **01** | |
| **78** | Rectangular channel of 10 and 12 m length | **02** | |
| **79** | “U” shaped channel 07 m long | **01** | |
| **80** | Triangular channel 03 m long | **01** | |
| **81** | Trapezoidal channel 06 m long | **01** | |
| **82** | Reels and micro reel | **05** | |
| **83** | Meteorological station (shelter, rain gauge, Colorado tank, pluviograph, etc.) | **01** | |
| **84** | Various topographic devices | | |
| **85** | Support workshop for making models and channels | **02** | |

| | | | |
|---|---|---|---|
| | (circular saw, band saw, lathes, milling machine, sheet metal cutting, etc.) | | |

**Laboratory title: Hydrology Laboratory**
**Student capacity: 30**

| No. | Equipment title | Number | observations |
|---|---|---|---|
| **01** | Hydrology study bench | **01** | |
| **02** | Rain simulator | **01** | |
| **03** | Lysimeter | **02** | |
| **04** | Infiltration and drainage study bench | **01** | |
| **05** | Depth moisture meter with neutron probe | **01** | |
| **06** | Recorder | **02** | |
| **07** | Blood pressure monitor | **17** | |
| **08** | Rheological apparatus | **01** | |
| **14** | Reels and micro reel | **05** | |
| **15** | Meteorological station (shelter, rain gauge, Colorado tank, pluviograph, etc.) | **01** | |

**Laboratory title: Surface Hydraulics Laboratory**
**Student capacity: 30**

| No. | Equipment title | Number | observations |
|---|---|---|---|
| **01** | RECTANGULAR CHANNEL OF 10 AND 12 M LENGTH | **01** | |
| **02** | “U” SHAPED CHANNEL 07 M LONG | **01** | |
| **03** | TRIANGULAR CHANNEL 03 M LONG | **01** | |
| **04** | TRAPEZOIDAL CHANNEL 06 M LONG | **01** | |
| **05** | Numerical simulation of a viscoplastic flow | **01** | |
| **06** | High resolution acoustic Doppler profiler | **01** | |
| **07** | Plane-plane rheometry for rheological characterization. | **01** | |
| **08** | Flow measurement test bench (Different types of flow meter) | **01** | |

**Laboratory title: Pumps and pumping stations laboratory**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| **01** | AUTOMATED CENTRIFUGAL PUMPS STUDY BENCH WITH FLOW REGULATION | **01** | |
| **02** | CENTRIFUGAL PUMP TEST BENCH | **01** | |
| **03** | CENTRIFUGAL PUMPS TEST BENCH, SERIES AND PARALLEL MOUNTINGS | **01** | |
| **04** | PELTON TURBINE TEST BENCH | **01** | |
| **05** | PUMP DEMONSTRATION MODEL IN SECTION | **08** | |
| **06** | Various pump test bench | **01** | |
| **07** | Axial pump experiment module | **01** | |
| **08** | PUMP CONTROL AND AUTOMATION BENCH | **01** | |
| **09** | PUMP CONTROL EQUIPMENT | **01** | |

**Laboratory title: Fluid Mechanics Laboratory**

**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| **01** | Fluid hydrodynamic test bench | **02** | |
| **02** | Experiment module for piping networks | **02** | |
| **03** | Hydrostatic test bench | **04** | |
| **04** | Determination of vertical descent speed | **02** | |
| **05** | Basic Fluid Dynamics Module | **02** | |
| **06** | Apparatus for studying hydrostatic pressure | **03** | |
| **07** | Bernoulli's law demonstration apparatus | **02** | |
| **08** | Device for analyzing flow through an orifice | **03** | |
| **09** | Ap.demonstration of losses in fittings and pipes | **02** | |
| **10** | Osborne Reynolds demonstration apparatus | **02** | |
| **11** | Automatic sampler with 24 Stations (01 l) | **01** | |
| **12** | Corrosion tester with Amp/Volt | **01** | |
| **13** | Water hammer demonstration device in pipes | **01** | |
| **14** | Pipe loss demonstration panel | **01** | |
| **15** | Sectional model of special parts | **06** | |

**Laboratory title: Soil Mechanics Laboratory**
**Student capacity: 30**

| No. | Equipment title | Number | Comments |
|---|---|---|---|
| 01 | Equipment for specific weight tests | 05 | |
| 02 | Atterberg limits | 02 | |
| 03 | Particle size and sedimentometry test bench | 04 | |
| 04 | Permeability determination bench | 04 | |
| 05 | Edometra | 02 | |
| 06 | Strain Gauge Accessories | 03 | |
| 07 | Materials for physical characteristics and arrangement of particles | 01 | |
| 08 | Study bench for the hydraulic properties of soils (soil recognition and geotechnical applications) | 01 | |
| 09 | Microscopes | 04 | |
| 10 | Vertical stand for mechanics demonstration | 01 | |

**Laboratory title: Energy Conversion and Turbo Machine Laboratory**
**Student capacity: 30**

| | |
|---|---|
| **01** | **<u>Pelton turbine demonstration model</u>**<br>Note: requires the H1D bench for operation |
| **02** | **<u>Pump/PC demonstration model including:</u>**<br>Modular bench for pumps<br>Universal dynamometer with torque and speed sensors<br>Data acquisition system<br>Gear pump<br>Piston pump |
| **03** | Pump performance bench<br>(Microcomputer assisted) |

**Computer room**

- Student capacity: 15
- An internet room: 30 stations

**B- Internship sites and in-company training:**

| Training place | Number of students | Training period |
|---|---|---|
| Directorate of water resources of the wilaya (DRH) / Hydraulic subdivisions | 05 | 15 days |
| ADE Biskra | 05 | 15 days |
| NATIONAL HYDROGRAPHIC BASINS AGENCY | 05 | 15 days |
| Algerian Waters (ADE) | 05 | 15 days |
| URBA design office (formerly CADAT) | 05 | 15 days |
| National Sanitation Office (ONA) | 05 | 15 days |

**C- Master's support research laboratory(ies):**

| Head of the laboratory: GUERGAZI SAADIA |
|---|
| Laboratory approval number: 185 of 04/18/2001 |
| **Date :**<br>**Opinion of the Laboratory Head:**<br>**Research in surface and underground hydraulics LARHYSS** |

| Head of the laboratory: MASMOUDI RACHID |
|---|
| No. Laboratory approval: no. 42, 05/02/2001 |
| **Date :**<br>**Opinion of the Laboratory Head:**<br>**Hydraulic arrangements and environment LAHE** |

**D- Master's support research project(s):**

| Title of the project research | Project code | Start date of the project | End date of Project |
|---|---|---|---|
| | | | |

**E- Personal work spaces and ICT available at department level:**

The department provides the following spaces for this training:
1. 13 study rooms (20 places each),
2. 04 spaces in research laboratories intended for graduate students,
3. 02 computing and programming centers,
4. 02 Internet room,
5. 04 large rooms (50 seats each).

# II – Half-yearly organization sheets for specialty teaching

**Semester 1:**

| Teaching unit | Materials | Credits | Coefficient | Weekly hourly volume | | | Half-yearly Hourly Volume (15 weeks) | Additional Work in Consultation (15 weeks) | Evaluation mode | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Titled | | | Course | T.D. | TP | | | Continuous monitoring | Exam |
| **Fundamental EU Code: UEF 1.1 Credits: 18 Coefficients: 9** | Applied hydraulics | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 55:00 | 40% | 60% |
| | Urban hydrology | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 55:00 | 40% | 60% |
| | Pump and pumping station | 6 | 3 | 3h30 | 1h30 | | 67h30 | 82h30 | 40% | 60% |
| **Methodological EU Code: UEM 1.1 Credits: 9 Coefficients: 6** | Geographic Information Systems (GIS) | 3 | 2 | 1h30 | | 1h30 | 45:00 | 55:00 | 40% | 60% |
| | Computer-aided drawing (CAD) | 3 | 2 | | | 2h30 | 37:30 | 27:30 | 100% | |
| | Mini tutored project / Internship | 3 | 2 | | | 3:00 a.m. | 45:00 | 37:30 | | 100% |
| **EU Discovery Code: UED 1.1 Credits: 2 Coefficients: 2** | Entrepreneurship and management companies | 1 | 1 | 1h30 | | | 10:30 p.m. | 02:30 | | 100% |
| | Management of hydraulic projects (technical and administrative) | 1 | 1 | 1h30 | | | 10:30 p.m. | 02:30 | | 100% |
| **Transversal EU Code: UET 1.1 Credits: 1 Coefficients: 1** | English applied to hydraulics | 1 | 1 | 1h30 | | | 10:30 p.m. | 02:30 | | 100% |
| **Total semester 1** | | **30** | **18** | **3:00** | **04:30** | **07:00** | **397h30** | **320h00** | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **p.m.** | | | | | | |

**Semester2:**

| Teaching unit | Materials | Credits | Coefficient | Weekly hourly volume | | | Half-yearly Hourly Volume (15 weeks) | Additional Work in Consultation (15 weeks) | Evaluation mode | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Titled | | | **Course** | **T.D.** | **TP** | | | **Continuous monitoring** | **Exam** |
| **Fundamental EU Code: UEF 1.2 Credits: 18 Coefficients: 9** | Water treatment (processes and calculation) | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 82h30 | 40% | 60% |
| | Hydraulic drilling | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 55:00 | 40% | 60% |
| | Water catchment works (design) | 6 | 3 | 3:00 a.m. | 1h30 | | 45:00 | 55:00 | 40% | 60% |
| **Methodological EU Code: UEM 1.2 Credits: 6 Coefficients: 6** | Modeling of AEP systems | 2 | 2 | 1h30 | | 1h30 | 45:00 | 27:30 | 40% | 60% |
| | Diagnosis and rehabilitation of AEP systems | 2 | 2 | 1h30 | 1h30 | | 45:00 | 27:30 | 40% | 60% |
| | Mini tutored project / Internship | 2 | 2 | | | 3:00 a.m. | 45:00 | 37:30 | | 100% |
| **EU Discovery Code: UED 1.2 Credits: 2 Coefficients: 2** | Metrology and diagnostic means in AEP | 2 | 2 | 1h30 | 1h30 | | 45:00 | 02:30 | 40% | 60% |
| **Transversal EU Code: UET 1.2 Credits: 1 Coefficients: 1** | Respect forstandards and rules of ethics and integrity. | 1 | 1 | 1h30 | | | 10:30 p.m. | 02:30 | | 100% |
| **Total semester 2** | | **30** | **18** | **3:00** | **07:30** | **04:30** | **405h00** | **317h30** | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **p.m.** | | | | | | | |

**Semester 3:**

| **Unit teaching** | Materials | Credits | Coefficient | Weekly hourly volume | | | Half-yearly Hourly Volume (15 weeks) | Additional Work in Consultation (15 weeks) | Evaluation mode | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Titled | | | **Course** | **T.D.** | **TP** | | | **Continuous monitoring** | **Exam** |
| **Fundamental EU Code: UEF 1.3 Credits: 17 Coefficients: 9** | Design and calculation of water collection systems | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 82h30 | 40% | 60% |
| | Purification and reuse of waste water | 6 | 3 | 3:00 a.m. | 1h30 | | 67h30 | 55:00 | 40% | 60% |
| | Site organization and mechanization of work | 5 | 3 | 1h30 | 1h30 | | 45:00 | 55:00 | 40% | 60% |
| **Methodological EU Code: UEM 1.3 Credits: 9 Coefficients: 6** | Modeling of sanitation systems | 3 | 2 | 1h30 | | 1h30 | 45:00 | 27:30 | 40% | 60% |
| | Diagnosis and rehabilitation of collection systems | 3 | 2 | 1h30 | 1h30 | | 45:00 | 27:30 | 40% | 60% |
| | Mini tutored project / Internship | 3 | 2 | | | 3:00 a.m. | 45:00 | 37:30 | | 100% |
| **EU Discovery Code: UED 1.3 Credits: 2 Coefficients: 2** | Metrology and diagnostic means in sanitation | 2 | 2 | 1h30 | 1h30 | | 45:00 | 02:30 | 40% | 60% |
| **Transversal EU Code: UET 1.3 Credits: 1 Coefficients: 1** | Documentary research and dissertation design | 2 | 1 | 1h30 | | | 10:30 p.m. | 02:30 | | 100% |
| **Total semester 3** | | **30** | **18** | **1:30 p.m.** | **07:30** | **04:30** | **382h30** | **317h30** | | |

## Semester4

Internship in a company culminating in a dissertation and a defense.

| | VHS | coefficient | Credits |
|---|---|---|---|
| **Personal work** | 150.0 | 09 | 18 |
| **Internship in company** | 150.0 | 06 | 09 |
| **Seminars** | 15.0 | 02 | 03 |
| **Other (Framing)** | - - | - - | - - |
| **Total Semester 4** | 315.0 | 17 | 30 |

**This table is given for information purposes only.**

## Evaluation of the End of Master Cycle Project

- Scientific value (jury assessment) /6
- Writing of the dissertation (jury assessment) /4
- Presentation and response to questions (Jury assessment) /4
- Appreciation of the supervisor /3
- Presentation of the internship report (Jury assessment) /3

**Overall summary of the training:** indicate the separate global VH in progress, TD, for the 04 semesters of teaching, for the different types of EU.

| EU / V.H. | UEF | EMU | UED | UET | TOTAL |
|---|---|---|---|---|---|
| **Course :** | 405 | 112.5 | 82.5 | 67.5 | 667.5 |
| **TD:** | 202.5 | 45 | 45 | 0 | 292.5 |
| **TP:** | 0 | 240 | 0 | 0 | 240 |
| **Personal work** | 742.5 | 350 | 15 | 7.5 | 1115 |
| **Total** | 1350 | 747.5 | 142.5 | 75 | 2315 |
| **Credits** | 54 | 27 | 6 | 03 | 120 (90+30 FROM S4) |
| **% IN CREDITS FOR EACH EU** | 60% | 30% | 10% | | 100% |

# III-Detailed program by subject semesterS1

**Semester:1**
**Teaching unit: UEF1.1**
**UEF 1.1.1 subject: Applied hydraulics**
**VHS: 67h30 (Class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

This subject aims to deepen the notions of drinking water supply and general hydraulics acquired in the bachelor's degree, and to help students understand hydraulic phenomena, the equations which govern them and their solutions. As well as the presentation of storage and distribution works and their dimensions.

**Recommended prior knowledge**

- Mathematics basics
- Knowledge of MDF and hydraulics
- Hydrology concepts

**Content of the material:**

**Chapter 1: Source captures**
1.1 General
1.2 Project study and preliminary work
1.3 Execution of works
1.4 Catchment of bottom water
1.5 Surface water capture

**Chapter 2: Nature of pipes (Under pressure and gravity flow)**
3.1. Cast iron pipes
3.2. Steel pipes
3.3. Concrete pipes
3.4. Plastic pipes
3.5. Commissioning
3.6. Identification, execution plans and signage

**Chapter 3: Tanks**
2.1 Advantages
2.2 Distribution of distribution flow rates
2.3 Consumption
2.4 Tank location
2.5 Tank capacity
2.6 Determination of shape and implementation
2.7. Construction principle
2.8. Water requirements for fire defense
2.9 Signaling and remote control installations (remote control)

**Chapter 4: Water distribution networks**
4.1. Types of networks
4.2. Conditions on speeds and pressures
4.3. Computing throughput

4.4. Calculation of branched networks
4.5. Calculation of mesh networks
4.6. Network returns
4.7. Leak detection

**Chapter 5: Accessory organs-faucets**
5.1. Gate valves
5.2. Strainers
5.3. Traps - suction cups
5.4. Pressure and flow reducers
5.5. Flow - pressure stabilizers
5.6 Control valves
5.7 Security bodies

**Chapter 6: Pipe protection**

**Observation :**
**The tutorial sessions will be carried out in the form of a mini-project that the teacher proposes according to the content of the subject.**

**Evaluation method:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references**:

1. **BRIERE FG**. Water distribution and collection. Editions de l'Ecole Polytechnique de Montréal, 1994, 365 p.
2. **VALIRON**., Lyonnaise des Eaux. Handbook for the Water Supply and Sanitation Manager. Volume I Water in the city Water supply. Paris, Technique etdocumentation Lavoisier, 1994. 435 p.
3. **DUPONT**. Urban hydraulics, Volume 2: Transport structures Elevation and distribution of water. Paris, Eyrolles, 1979, 484 p. 4th ed.
4. **BONNIN J**. Urban hydraulics applied to small and medium-sized towns. Paris, Eyrolles, 1986, 228 p.

**Semester:1**
**Teaching unit: UEF 1.1**
**Subject UEF 1.1.2: URBAN HYDROLOGY**
**VHS: 67h30 (Class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

## Teaching objectives:

This subject allows, essentially, to acquire fundamental notions relating to hydrological data and thus to approach the calculation of the rainfall contributions of urbanized watersheds and also to learn about the dimensioning of retention basins.

## Recommended prior knowledge

Concepts of hydrology, topography and statistics.

## Content of the material:

### Chapter 1: General information on urban hydrology and sanitation

1. Urban hydrology
1.1. Definition
1.2. Effect of urbanization on the water cycle
2. Sanitation (technical aspect of urban hydrology)
2.1. Definition and objectives
2.2. Summary of the design of a sanitation network

### Chapter 2: Hydrological data

1. Measurement of precipitation
2. Use of rainfall data
3. Concept of intensity
4. Cumulative rainfall curve ethyetogram (Application: Characteristics of rain events)
5. Concentration time tc
6. Runoff coefficient
7. Frequency, Return Period
8. Intensity-Duration-Frequency curves (Application: Modeling IDF curves)

### Chapter 3: Methods for assessing storm flows

1. Definition and concepts
2. Rational method
2.1. Assumptions of the rational method
2.2. Applications
3. Superficial methods
3.1. Calculation principles
3.2. Applications
3.3. Hybrid method
3.4. So-called transfer methods

3.5. HORTON method
3.6. Global methods
3.7. Comparative test between calculation methods
3.8. Computerized models for simulating water runoff in urban areas
SWMM family models
HEC family models
Reduction of runoff flows in urban areas

**Chapter 4: Runoff Retention**

1. Definition
2. calculation principles
3. Application: Rain method

**Chapter 5: Assessment of polluting flows**

1. Typology of releases
2. Pollutant loads
3. Estimation of hydraulic and polluting loads

**Evaluation method:**

Continuous monitoring 40%; Exam: 60%

**Bibliographic references**:

**Bennis S. (2009).**Hydrology and hydraulics. 2nd Edition, Press of the University of Quebec.

**Bertrand-Krajewski J.-L. (2007).**Urban Hydrology Course. Part 2: The Rain. INSA Lyon.

**Bertrand-Krajewski J.-L. (2006).**Urban Hydrology Course. Part 4: Runoff. INSA Lyon.

**Bourrier R. (1997).**Sanitation networks. Calculations-Applications-Perspectives. 4th Edition, Tec & Doc.

**Brière FG (1997).**Water distribution and collection. Ed. of the Ecole Polytechnique de Montréal. Canada.

Guerrée H. and Gomella C. (1978). Wastewater in urban or rural areas. Ed. Eyrolles.

**Kerloc'h B. Maelstaf D**. The sizing of urban sanitation networks https://www.fichier-pdf.fr/2017/01/05/le-dim-des-reseaux-d-sanitation/.

**Laborde JP (2000)**. Elements of surface hydrology. http://cours.st.free.fr/semestre%207/M1%20cours/hydro/cours/Cours%2520HydrologieJPL.pdf.

**Semester:1**
**Teaching unit: UEF 1.1**
**Subject UEF 1.1.3: Pumps and pumping stations**
**VHS: 67h30 (Class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

Acquire knowledge of the equipment upstream and downstream of a pumping station
Know the different types of pumping stations
Choose the type of pumping station
Know how to solve the cavitation problem that affects pumps
Control of the location of pumps in non-cavitation zones
Type of pumping stations
Learn to plan pumping stations
Learn to operate the hydro-energy and hydraulic structures and equipment of the pumping station
Acquire theoretical and practical knowledge on the construction and operating principle of Pelton, Francis and Kaplan turbines.

**Recommended prior knowledge:**

Basics of hydrology and climatology
Applied statistics
The use of computer tools.

**Content of the material:**

**Chapter I: Pump reminders**

**Chapter II: Coupling of pumps in series and parallel**
Identical and non-identical pumps in series
Identical and non-identical pumps in parallel
Working point
Setting the operating point
Study of the different variants of the operating point

**Chapter III: Classification and maintenance of pumping stations**
Introduction
Sizing of pumping stations
Possible incidents
Different ways to troubleshoot

**Chapter IV: Laws of similarities in incompressible fluid pumps**
Introduction
Reminder of similarity
Theoretical study of similarity

Determination of specific speed
Influence of rotation speed on pump characteristics
Influence of impeller diameter on pump characteristics
Classification of vane pumps according to their specific speed

**Chapter V: Study of cavitation in pumps**
Cavitation phenomenon
Causes and consequences of cavitation
Theoretical study of cavitation
Permissible suction height
NPSH for installation under load and under pressure

**Chapter VI: Hydraulic turbines**
Introduction
Role of turbines in hydraulics
Classification of turbines
Pelton turbine
Francis turbine
Kaplan turbine
Hydroelectric station

**Evaluation method:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references**:

**SAVATIER – Paperback**:Pumps and pumping stations. 1994

**VIOLLET Pierre-Louis**:History of hydraulic energy: Mills, pumps, wheels and turbines from Antiquity to the 20th century.

**PERNÈS Pierre**,One-dimensional hydraulics Part 2: Water hammer and mass oscillation phenomenon. Centrifugal pumps.

**Pin**: (NF ISO 17559): hydraulic transmissions, electrically controlled hydraulic pumps .06-2004 - 28p.

**Pin**, The pumps. Manual selection, application to variable speed. (Technical Coll., ref. MD1 POMPS). Author(s)MANON Jean- 01-2002 - 260p. 21x29.6

**Related NF**(EN 23661): end suction centrifugal pumps, dimensions relating to bases and installation.

**Hardcover**(NF EN ISO 5198): centrifugal, elico-centrifugal and propeller pumps. Precision class hydraulic operating test code. Author(s)NF ISO 5198- 12-1987 –

**Semester: 1**
**Teaching unit: UEM 1.1**
**UEM 1.1.1 material:GEOGRAPHIC INFORMATION SYSTEM**
**VHS: 45h00 (Class: 1h30, TP: 1h30)**
**Credits: 3**
**Coefficient: 2**

**Teaching objectives:**

The course will aim to show master's students the use of new geographic positioning tools and the possibilities of crossing by layer of information.

**Recommended prior knowledge**

Topography, Maths, Physics. Using the ingormatic tool

**Content of the material:**

**Chapter 1- Basic Design of a GIS**
**Chapter 2- Projection systems**
**Chapter 3- Presentation of Mapinfo software. (Qgis or Arcgis)**
**Chapter 4- Digitalization**
**Chapter 5- Formatting**
**Chapter 6- Thematic Mapping**
**Chapter 7- Sectorization**
**Chapter 8- Digital terrain model DEM**
**Chapter 9- GIS application**

**Evaluation method:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references**:

**AUPELF**: Summary of Remote Sensing: Principles and methods F. Bonn and G. Rochon. Editions Presses de l'Université du Québec.

**JP Cocquerez and S. Philipp**: Image analysis: filtering and segmentation.. Edition Masson.

**JA RICHARDS, X. JIA. Springer:**Remote Sensing Digital Image Analysis.

**MC Girard and CM Girard:**Processing of remote sensing data Editions Dunod, Paris.

**MC Girard and CM Girard**:from satellites to GIS. Edition Nathan ROBIN University.

**Semester: 1**
**Teaching unit: UEM 1.1**
**UEM 1.1.2 material:Computer-aided drawing (CAD)**
**VHS: 37h30 (TP: 2h30)**
**Credits: 3**
**Coefficient: 2**

**Teaching objectives:**

The course will aim to introducemaster's students in the use of AutoCAD software as a drawing tool and Covadis software as a tool for developing topographical plans and establishing longitudinal profiles.

**Recommended prior knowledge**

Basic notions of topography and computer science.

**Content of the material:**

**Part 1: AutoCAD**

1. Autocad Versions
2. Presentation of the Autocad window
3. The coordinate system
4. Snap to objects / polar mode
5. The most common objects:
6. The most common commands.
7. Layer management
8. Miscellaneous orders
9. Edit/create objects.
10. Handles/grips
11. Visualization (zoom, pan, scu, view)
12. Dressing: 1 - hatching
13. Dressing: 2 - the rating
14. Dressing: 3 - the text
15. Dressing: 4 – the tables
16. Blocks
17. Attributes in blocks
18. External references: xrefs, dwf, images
19. Layout: presentations-object/paper space
20. Layout - trace configuration
21. Organization of the trace
22. Tracing

**Part 2: Covadis**

1. Generalities and principle of Covadis
2. Topography
3. Assisted drawing
4. Covadis 3D
5. Digital terrain models
6. Network design

**Comment :**
The course takes place essentially in the form of guided tutorials after a theoretical explanation of a notion or a particular problem in relation to activities in the field of urban hydraulics.

**Evaluation method:**
**100% Continuous Control**

**Bibliographic references**:

**Jena-Pierre Gousset, Jean-Claude Capdebielle, René Pralat**. The Survey, CAD-CAD with Autocad - Price study. Editions Eyrolles, 2011

**Olivier Hit Him,Jean-Yves Gouez:AutoCAD 2022 - From fundamentals to detailed presentation around professional projects, Edition Eni, 2021**

Manuals, tutorials, ...
Web sites

**Semester: 1**
**Teaching unit: UEM 1.1**
**UEM 1.1.3 material:Mini tutored project**
**VHS: 45h00 (TP: 3h00)**
**Credits: 3**
**Coefficient: 2**

## Teaching objectives:

The mini-tutored project is used to best support the student. The virtues of tutoring are such that the student develops critical thinking and curiosity..

## Recommended prior knowledge

Basic notions of hydraulics, topography, IT, applied hydraulics

## Content of the material:

A mini project (two per semester) / Internship (15 days) will be chosen during each semester by the student.

The mini project will affect the following areas:

- AEP
- Sanitation
- Site organization
- GIS
- Sizing a wastewater treatment plant
- Environmental impact study
- Preparation of estimated, quantitative and estimated quotes
- Preparation of price schedules
- Development of hydraulic specifications
- A theme proposed by the teacher
-

The internship will be carried out at the level of establishments agreed with the university and will be sanctioned by a report noted and discussed with the tutor teacher

## Evaluation method:

Review: 100%

**Semester: 1**
**Teaching unit: UED 1.1**
**UED 1.1.1 subject:Entrepreneurship and business management**
**VHS: 10:30 p.m. (class: 1h30)**
**Credits: 1**
**Coefficient: 1**

## Teaching objectives:

The objectives of the course are as follows:
Familiarize the student with entrepreneurship,
Learn about project management for carrying out industrial projects
Understand the different forms of intellectual property projects for the realization of industrial projects

## Content of the material:

**Chapter I: Introduction**
Define projects
Common characteristics
“Management” and “management” of project
The project and the operation
Comparison of projects and operations

**Chapter II: Project organization models**
The entrepreneur model
The standard model of the Project Management Institute (PMI)
The sequential project management model
The concurrent engineering (CI) model

**Chapter III: Managing projects**
Project management issues

**Chapter IV: Project constraints**
The temperature
The budget

**Chapter V: Project phasing**
Upstream
Freeze
Realization
Project phases
Project management tools
Project stakeholders
Phases Characteristics
Project management tools
Project stakeholders

## Evaluation method:

*100% Review*

**Bibliographic references**:

**Asquin A., Garel G. and Picq T**., 2007, “When the project mode creates suffering at work”, Manage and Understand, no. 90, p. 43-54.

**Boutinet J.-P., 1993**, Anthropology of the project, Presses universitaire de France (Puf), coll. “Psychology today”.

**Clark KB and Wheelwright SC, 1992**, “Organizing and leading heavyweight development teams”, California Management Review, Spring, p. 9-28.

**ClotY., 2010**, Work at heart, La Découverte, coll. “Free notebooks”.

**Couillard J. and Navarre C., 1993**, “What are the factors of project success? Do we need more organization? More tools? More communications? », Management 2000, vol. 9, no. 2, p. 167-190.

Declerck RP, Eymery P. and Crener MA, 1980, Strategic Project Management, ed. Men and techniques.

Ecosip (Economics of integrated production systems), Giard V. and Midler C. (dir.), 1993, Project management and companies; diversity and convergences, Paris, Economica.

**Gareis R., 1989**, “Management by projects, the management approach for the future”, International Journal of Project Management, vol. 7, no. 4, p. 243-249.

**Garel G., 2003**, Project management, Paris, La Découverte, coll. " Landmarks ".

**Midler C., 1996,**“Managerial models and economic regulations of design”

**Terssac G. and Friedberg E.**(dir.), Cooperation and design, Toulouse, Octares, p. 63-85.

**Navarre C., 1992,**“From the battle to produce better to the battle to improve design”, Management 2000, n° 6, p. 13-30

**Semester: 1**
**Teaching unit: UED 1.1**
**UED 1.1.2 subject:Management of hydraulic projects (technical and administrative)**
**VHS: 10:30 p.m. (class: 1h30)**
**Credits: 1**
**Coefficient: 1**

## Teaching objectives:

The objective of this teaching unit is to provide the student in training with knowledge of the basic tools for the administrative and technical management of a hydraulic project.

## Recommended prior knowledge

Basic notions of legislation and hydraulics

## Content of the material:

**Chapter 1: Hydraulics framework**

Water sector stakeholders
Administrative, technical and operational principles
Reference texts
Technical options and their application criteria
Equipment operation and management

**Chapter 2: Main stages of a hydraulic project**

Project management of hydraulic projects
Definition and responsibilities of project management
Current forms of project management
Project management delegation
Role of the Water Resources Department in local project management
Project initiation
Development of a project sheet
Research and mobilization of financing
Development of a hydraulic project execution file
Content of the hydraulic project execution file
Detailed preliminary project file
Tender file
Drafting specifications and judging offers
Drafting specifications
Judging of offers
Approach
The technical note
The technical skills and references of the design office
The capabilities of the design office and its technicians
The price of the service

**Chapter 3: Launch of work**

Validation of the order by the ordering party (ODS).
Administrative and technical preparation of the site (execution plan, construction schedule, etc.).
Implementation, site visit and site installation

**Chapter 4: Work monitoring**

Daily on-site checks by the works manager.
Daily communication with the project owner (progress, positive points, arrangements to be made, etc.).
Possible modifications following the solutions provided.
Quantitative measurement and estimate of the work carried out.
Proof test (Hydraulic Test of the installed network).

**Chapter 5: Finalization**

Closure of the project.
Acceptance of the site by the project owner.
Archiving the file.
Updating of alignment plans on the GIS database.

**Evaluation method:**

Final exam: 100%.

**Bibliographic references**:

**Afitep**: Project management dictionary. AFNOR Edition, Paris, 2004.

**André Claude**: Financial management of construction sites. Edition Le Moniteur, Paris, 1996.

**Francis Nicol**: The work coordinator's schedule. Edition EYROLLES, Paris 1978.

**Jacques Armand and Yves Rafestin**: Manage your construction site. Edition Le Moniteur, Paris, 1999.

**Jean le Bissonnais**: Project Management from A to Z. Edition AFNOR, Paris, 2003

**Semester: 1**
**Teaching unit: UET 1.1**
**UET 1.1.1 material:**English applied to hydraulics 1
**VHS: 10:30 p.m. (class: 1h30)**
**Credits: 1**
**Coefficient: 1**

**Teaching objectives:**

Introduce the student to original texts in English oriented towards the specialty. Strengthen their knowledge of the language. Help him understand and synthesize a technical document. Allow him to understand a conversation in English held in a scientific framework.

**Recommended prior knowledge**

Basic English vocabulary and grammar

**Content of the material:**

- Written comprehension: Reading and analysis of texts relating to the specialty.
Water resources for water supply
Flow types
Network water supply
Urban hydrology
Creation and management of hydraulic projects

**Oral comprehension**: From authentic popular science video documents, note taking, summary and presentation of the document.

**Oral expression**: Presentation of a scientific or technical subject, development and exchange of oral messages (ideas and data), Telephone communication, Gestural expression.

**Written expression**: Extraction of ideas from a scientific document, Writing a scientific message, Exchange of information in writing, writing of CVs, letters requesting internships or jobs.

**Evaluation method:**

Review: 100%.

**Bibliographic references**:

**PT Danison**, Practical guide to writing in English: uses and rules, practical advice, Editions d'Organization 2007

**J. Comfort, S. Hick, and A. Savage**, Basic Technical English, Oxford University Press, 1980

**EH Glendinning and N. Glendinning**, Oxford English for Electrical and Mechanical Engineering, Oxford University Press 1995

# III-Detailed program by subject semesterS2

**Semester: 2**
**Teaching unit: UEF 1.2**
**UEF subject 1.2.1: WATER TREATMENT**
**VHS: 67h30 (class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

In this subject the student will learn the different methods and stages of drinking water treatment. Mastered the treatment processes used in the water sector; desalination, reverse osmosis, electrodialysis, ion exchange.

**Recommended prior knowledge:**

Chemistry concepts

**Content of the material:**

**Part 1: Water treatment**

**Chapter 1: Coagulation-Floculation**
**Chapter 2: Rush**
**Chapter 3: Decantation**
**Chapter 4: Filtration**
**Chapter 5: Disinfection**
**Chapter 6: Adsorption**

**Part 2: Treatment procedures**

**Chapter 1 :General**
**Chapter 2 :Separation by Membranes**
**Chapter 3:Reverse osmosis**
**Chapter 4:Electrodialysis**
**Chapter 5:Distillation**
**Chapter 6:Ion exchange**
**Chapter 7:Adsorption**
**Chapter 8:Demineralization of fresh water**
**Chapter 9:Desalination of seawater and brackish water**

**Observation :**
**In TD, the work will be small in the form of a mini-project which consists of sizing a drinking water treatment station**

**Evaluation method:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references:**

**Raymond Des jardines**: The Treatment of Potables, Edition Dynolds, Paris 1981.
**Claude CARDOT:**Water treatment.
**Bontoux J**: Introduction to the study of fresh water: natural water, wastewater and drinking water
**HENRI R**: Theoretical foundations of chemical treatment
**Mohand Saïd OUALI**: bear of biological unit processes and water treatment

**Semester: 2**
**Teaching unit: UEF 1.2.**
**UEF 1.2.2 material:Hydraulic drilling**
**VHS: 67h30 (class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

Estimation of underground resources, Mastering the different stages of drilling, the tools necessary for its creation and Source capture.

**Recommended prior knowledge:**

Hydrogeology.

**Content of the material:**

**Chapter 1: Types of aquifers**
**Chapter 2: Darcy's Law**
**Chapter 3: The captive and free defusibility equations**
**Chapter 4: Well hydraulics**
4.1 Well completely crossing a free water table
4.2 Wells passing entirely through a loaded water table
**Chapter 5: Execution of exploitation drilling**
5.1 Definition
5.2 Classification of different types of drilling rigs
**Chapter 6**: Tibular equipment
6.1 Purpose of casing
6.2 Casing program
6.3 Choice of strainer
**Chapter 7: Drilling mud**
7.1 Roles of mud
7.2 Composition of the sludge
**Chapter 8: Cementation in borings**
8.1 Purpose of borehole cementing
8.2 Classification of cement
**Chapter 9: Development**

**Evaluation mode:**

Continuous monitoring: 40%; Exam: 60%

**Bibliographic references**:

**Albert Mabillot:**Water drilling, Ed. Eyrolles, Paris 2005

**Mustapha Abdelhakim:**Construction of water wells, European university edition,Paris, 2018.

**Semester: 2**
**Teaching unit: UEF 1.2.**
**UEF subject 1.2.3: Water catchment structures**
**VHS: 67h30 (class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

This course aims to teach master's students the techniques for mobilizing and capturing groundwater and surface water.

**Recommended prior knowledge:**

The contents of hydrology, hydrogeology and drawing must be acquired beforehand.

**Content of the material:**

**Chapter 1. Introduction**

**Chapter 2. Hydrogeology reminder (land, water tables and sources)**

**Chapter 3. Preliminary work for water collection**
Choice of location
Location and environment
Presentation of plans
Water protection

**Chapter 4. Groundwater Catchment Design**
Source capture
Capture in aquifers

**Chapter**5. Design of surface water catchment
River water capture
Lake and dam water capture

**Chapter**6. Protection of catchments

**Evaluation mode:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references**:

**A. DUPONT.**Urban hydraulics (Volume 1), Eyrolles.
Brière, François G. Distribution and collection of water, Presses Internationales Polytechnique, second edition, 2000

**Mr. BOUYARD**. Mobile dams and diversion works, , Edt. Eyrolles, Paris 1981

**Semester: 2**
**Teaching unit: UEM 1.2.**
**UEM 1.2.1 subject: Modeling of AEP systems**
**VHS: 45h00 (class: 1h30, practical work: 1h30)**
**Credits: 3**
**Coefficient: 2**

**Teaching objectives:**

This subject will aim to enable the student to master the software for modeling drinking water supply and sanitation networks as well as carrying out a measurement campaign for the calibration and validation of the modeling results. hydraulic networks.

**Recommended prior knowledge:**

The student must have knowledge in fundamental subjects, namely mathematics, drinking water supply, sanitation and IT.

**Content of the material:**

**Chapter I: Modeling: concepts, approaches**

Objectives of modeling hydraulic networks

Definition of a hydraulic model

**Chapter II: Types of models**

The main stages of modeling

Presentation of the modeling software used

Construction of the physical model of the network

The measurement campaign and model calibration

**Chapter III: Coupling between a GIS and different hydraulic models**

**Evaluation mode:**

Continuous monitoring: 40%; Exam: 60%

**Bibliographic references:**

Books and handouts, websites, etc.

**https://www.epa.gov/water-research/epanet**

**https://hmf.enseeiht.fr/travaux/beiepe/book/export/html/1002**

**Semester: 2**
**Teaching unit: UEM 1.2.**
**UEM 1.2.2 material:DIAGNOSIS AND REHABILITATION OF AEP SYSTEMS**
**VHS:45h30 (class: 1h30, tutorial: 1h30)**
**Credits: 3**
**Coefficient: 2**

**Teaching objectives:**

This course aims to teach master's students the methodology to follow to carry out a diagnosis of an AEP system and to assess its performance in order to propose rehabilitation work.

**Recommended prior knowledge:**

The contents of applied hydraulics as well as cartography and GIS must first be acquired.

**Content of the material:**

**Chapter I. Introduction**
Definition, objectives and methodology
Entry of plans and data from the existing system
Description of the existing system
Data collection
System check
Development of the GIS

**Chapter II: Diagnosis of production and storage works**
Physical diagnosis of distribution network components
Functional network diagnosis
Network sectorization
Survey and measurements among subscribers
Measurements on the distribution network
Checking for leaks
Distribution network modeling

**Chapter III: Rehabilitation techniques**

**Chapter IV: Master plan for the rehabilitation and rebalancing of the AEP system**
Socio-economic surveys
Matching needs – resources
Formulation of the water transfer master plan (production-conduction)
Formulation of the distribution network master plan

**Evaluation mode:**

Continuous monitoring: 40%; exam: 60%.

**Bibliographic references**:

**A.DUPONT**. Urban hydraulics (Volumes 2 and 3), Eyrolles, 1978.

**FG Briere**. Water distribution and collection, Presses Internationales Polytechnique, second edition, 2000.

**F.VALIRON**. Water management, press of the national school of bridges and roads, first edition, 1989

**J.BONVIN**. Urban hydraulics 1, Hes.so, 2005

Supplier catalogs (Pont a Mousson, Chiali, Bayard, Ramus, etc.)

Writing guides

**Semester: 2**
**Teaching unit: UEM 1.2**
**UEM 1.2.3 material:Mini tutored project**
**VHS: 45h00 (TP: 3h00)**
**Credits: 3**
**Coefficient: 2**

## Teaching objectives:

The mini-tutored project is used to best support the student. The virtues of tutoring are such that the student develops critical thinking and curiosity..

## Recommended prior knowledge

Basic notions of hydraulics, topography, IT, applied hydraulics

## Content of the material:

A mini project (two per semester) / Internship (15 days) will be chosen during each semester by the student.

The mini project will affect the following areas:

- AEP
- Sanitation
- Site organization
- GIS
- Sizing a wastewater treatment plant
- Environmental impact study
- Preparation of estimated, quantitative and estimated quotes
- Preparation of price schedules
- Development of hydraulic specifications
- A theme proposed by the teacher
-

The internship will be carried out at the level of establishments agreed with the university and will be sanctioned by a report noted and discussed with the tutor teacher

## Evaluation method:

Review: 100%

**Semester: 2**
**Teaching unit: UED 1.2.**
**UED 1.2.1 subject:Metrology and diagnostic means in AEP**
**VHS:45h30 (class: 1h30, tutorial: 1h30)**
**Credits: 2**
**Coefficient: 2**

**Teaching objectives:**

Define the need for diagnostic action before the rehabilitation of drinking water network infrastructure

**Recommended prior knowledge:**

AEP courses

**Content of the material:**

**Chapter 1: General information on metrology**
Definition of the different types of metrology (Scientific, so-called laboratory, legal, Industrial); Metrology applied to AEP networks

**Chapter 2: Metrology of drinking water networks**
Pressure measurements; Flow velocity measurement; Flow measurements; Comparisons between calculation results and measurements.

**Chapter 3: Diagnosis of AEP networks**
Knowledge of heritage and operations.
Updating plans; Collection of data ; Network detection: Plan support; Updating the heritage inventory; Analysis of operation; “Needs/resources” assessment
**Sectorization**
Definition and characterization of sectors; Flow, level and pressure measurement points
**Measurement campaigns**
**Prioritization of sectors**

**Chapter 4: Detailed description of the entire network**
The overall plan; The water resource mobilized; Network inventory; Location of special equipment.

**Chapter 5: Analysis of the operation of the AEP network**

Hydraulic and electromechanical assessment of the pumping groups; Hydraulic balance of the network

Specific hydraulic study; Quantification and sectorization of leaks

**Chapter 6: Actively search for leaks**
**Pre-localization**.
Shut-off valves; Islandage; Quantification by direct feeding; Acoustic pre-localization; Direct mechanical listening.
**Location**
Direct and ground amplified electronic listening; Geo-radar; Mobile hydrophone.

**Evaluation mode:**

Final exam: 100%.

**Bibliographic references**:

**OIML V 2-200:2012**, International Metrology Vocabulary – Fundamental and General Concepts and Associated Terms (VIM)

**ISO 6817:1992**, Measurement of flow rate of a conductive fluid in closed pipes — Method using electromagnetic flow meters

**HUNAIDI O. (2000).**Leak detection in distribution pipes. Ph.D. National Research Council of Canada ISSN 1206. Canada.

**EISENBEIS P. (2004).**Statistical modeling of failure prediction on drinking water pipes. Doctoral thesis from Louis Pasteur University. France.

**DOUMBOUYA L. (2003).**Modeling of the Lausanne drinking water supply network. Lausanne city water service diagnosis and optimization, Network Techniques section, Switzerland.

**HAUTE-SAVOIE ; DEPARTMENT MANAGEMENT**ASSISTANCE; presentation of the Studies-Diagnostics division; Study diag. AEP (1986).

**WATER AGENCIES. (2004).**Diagnosis of drinking water supply systems. Ministry of Ecology and Sustainable Development, France.

**Semester: 2**
**Teaching unit: UET 1.2**
**Subject UET 1.2.1: Respect forstandards and rules of ethics and integrity.**
**VHS: 10:30 p.m. (Class: 1h30)**
**Credits: 1**
**Coefficient: 1**

**Teaching objectives:**

Develop students' awareness of respect for ethical principles and the rules that govern life at university and in the world of work. Raise awareness about respecting and valuing intellectual property. Explain to them the risks of moral evils such as corruption and how to combat them, alert them to the ethical issues raised by new technologies and sustainable development.

**Recommended prior knowledge:**

Ethics and professional conduct (the foundations)

**Content of the material:**

**A. The respect of the rulesethics and integrity,**

**1. Reminder on the MESRS Charter of Ethics and Professional Conduct:**Integrity and honesty. Academic freedom. Mutual respect. Requirement for scientific truth, objectivity and critical thinking. Equity.Rights andobligationsof the student,the teacher, administrative and technical staff,

**2. Integrity and responsible research**

- Respect for ethical principles in teaching and research
- Responsibilities in teamwork: Professional equality of treatment. Conduct against discrimination. The search for the general interest. Inappropriate conduct in the context of collective work
- Adopt responsible conduct and combat abuses: Adopt responsible conduct in research. Scientific fraud. Conduct against fraud. Plagiarism (definition of plagiarism, different forms of plagiarism, procedures to avoid unintentional plagiarism, detection of plagiarism, sanctions against plagiarists, etc.). Falsification and fabrication of data.

**3. Ethics and professional conduct in the world of work:**
Legal confidentiality in business. Loyalty to the company. Responsibility within the company, Conflicts of interest. Integrity (corruption in the workplace, its forms, its consequences, methods of combating and sanctions against corruption)

**B- Intellectual property**

**I- Fundamentals of intellectual property**

1- Industrial property. Literary and artistic property.

2- Rules for citing references (books, scientific articles, conference communications, theses, dissertations, etc.)

**II- Copyright**

**1. Copyright in the digital environment**

Introduction. Copyrightdatabases, software copyright. Specific case of free software.

**2. Copyright in the Internet and e-commerce**

Domain name law. Intellectual property on the internet. E-commerce site law. Intellectual property and social networks.

**3. Patent**

Definition. Rightsin a patent. Usefulness of a patent. Therepatentability. Patent applicationin Algeria and around the world.

**III- Protection and valorization of intellectual property**

How to protect intellectual property. Violation of rights and legal tool. Vvaluation of intellectual property. Protection of intellectual propertyin Algeria.

**C. Ethics, sustainable development and new technologies**

Link between ethics and sustainable development, energy saving, bioethics and new technologies (artificial intelligence, scientific progress,Humanoids, Robots, drones,

**Evaluation mode:**

Final exam: 100%.

# III-Detailed program by subject semesterS3

**Semester: 3**
**Teaching unit: UEF 1.3.**
**Subject UEF 1.3.1: Design and calculation of sanitation systems**
**VHS: 67h30 (Class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

This course aims to teach master's students the techniques for designing wastewater collection and evacuation systems.

**Recommended prior knowledge:**

The content of the applied hydraulics must be acquired beforehand.

**Content of the material:**

**Chapter I: General information on sanitation networks**
Prior knowledge for the design of sanitation systems

**Chapter II: Estimation of flow rates to be evacuated**
Estimation of wastewater flow rates
Estimation of rainwater flows

**Chapter III: Calculation of a sanitation network**
Unitary network
Separative network (domestic wastewater, rainwater)

**Chapter III: Elements of a sanitation system**

Definition and choice of sanitation systems
Design of the elements of a collection network
Connection boxes (types and location)
Collection network (route, longitudinal profiles and street location)
Regards (visit, connection, change of direction, etc.)
Manhole cover (types and location)
Lifting station (design and calculation)
Pumps - overflow - storage tank
Storm overflows (design and calculation)
Retention basin (design and calculation)
Crossing works (design and calculation)
Constituent elements of a sewer network The main structures
Pipes (Type of pipes, Choice of pipe type, Joints)

**Observation**
**The supervised work will be carried out in the form of a mini-project which consists of sizing a collection network.**

**Evaluation mode:**

40% Continuous assessment and 60% Examination

**Bibliographic references**:

**FG Briere**. Water distribution and collection, Presses Internationales Polytechnique, second edition, 2000.

**F.VALIRON**. Water management, press of the national school of bridges and roads, first edition, 1989

**R.BOURRIER**. Sanitation networks, Edt. Lavoisier, Paris, 2008

**Semester: 3**
**Teaching unit: UEF 1.3.**
**UEF 1.3.2 material:Purification and reuse of waste water**
**VHS: 67h30 (Class: 3h00, tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives:**

In this subject, the student will learn the techniques for purifying liquid effluents, the operating modes of biological reactors and the basics of sizing waste water purification works, as well as the techniques for reusing purified waste water in agriculture. . The advantages and constraints linked to this practice are also controlled.

**Recommended prior knowledge:**
The fundamental notions of general hydraulics and the basics of chemistry

**Content of the material:**

**Part I: Biological treatments of urban wastewater**

**Chapter I: Pollution of water resources**
I.1. Sources of wastewater pollution
I.2. Classification of main pollutants
I.3. Pollution indicators in biological purification
I.4. Analysis of the parameters of the effluent to be treated
I.5. The main pre-treatment stages

**Chapter II: Biological processes for treating wastewater by lagooning**
II.2. The different types of lagooning
II.3. Operating principle of the natural lagoon
II.4. The advantages and disadvantages of the lagoon process
II.5.Sizing of lagoons

**Chapter III: Biological purification of urban wastewater using activated sludge**
III.1 Brief history of biological treatment with activated sludge
III.2. Reminder of the principles of biological purification using activated sludge
III.3. Sizing
III.4. Characteristic quantities of activated sludge treatment
III.5. Advantages and disadvantages of activated sludge purification
III.6. General information on sludge

**Chapter VI: Biological purification with fixed biomass (bacterial bed)**
IV. 1Operating principles
IV.2. Bacterial bed design
IV.3. Bacterial bed operating parameters
IV.4. The advantages and disadvantages of the bacterial bed

**Chapter V: The secondary decanter or clarifier**
V.1.The sludge recirculation system
V.2. Sludge settling mechanisms

## Part II: Reuse of wastewater

**Chapter I: Wastewater quality**

**Chapter II: Wastewater treatment plants and potential for reuse of wastewater**

**Chapter III: The importance of irrigation for sustainable development**

III.1. Regulatory aspect of the reuse of wastewater in Irrigation
III.2. The legislative framework of the EUER in Algeria
III.3. Chemical and microbiological constraints

**Observation**
**In Td, the work will be carried out in the form of a mini-project which consists of sizing a wastewater treatment plant.**

**Evaluation method:**

40% Continuous assessment and 60% Examination

**Bibliographic references**:

**Gaid A, (1984),**"Biological purification of urban wastewater volume I", OPU edition, Alger.

**Thomas O, (1955),**Wastewater meteorology, Tec et Doc, Ed Lavoisier, Cedeboc, 135-192 p.

**Richarde C, (1996),**water; bacteria; men and animals; Elsevier Publishing; Paris, P138.

**Regsek F, (2002),**water analysis, regulatory and technical aspects, Edition scrérén CRDPA quitaine, Bordeaux.

**Degremont2005**Memonto Water Technique 2nd edition volume 1 Lavoisier edition

**Lagardette J 2004-2005**drinking water and sanitation Johanat edition

**G. Abdelkader 1984**Tom1 "biological purification of wastewater".

**Baumont S, Camard JP, Lefranc A, Franconi A, (2004),**Reuse of wastewater: health risks and feasibility in Île-de-France. ORS Report, pp 220.

**Faiza Mekhalif**"Reuse of purified industrial wastewater as makeup water in a cooling circuit 2009".

**Vaillant JR, (1974)**Improvements and new developments for the purification of waste water: urban waste water and industrial waste water, Edition, Eyrolles, Paris,

**Rodier J, (2005)**The analysis of natural water, waste water, sea water, 8th Edition DUNOD technique, Paris, pp 1008-1043.

**Bekkouche M, Zidane F, (2004)**, Design of a wastewater treatment plant for the city of Ouargla by lagooning. Same. Eng. Saharan hydraulics. Univ. From Ouargla.67p.

**Banzaoui NEt Elbouz F, (2009),**Wastewater purification using activated sludge processes in the municipality of Touggourt. Mem.Eng. chemistry.Univ. From Annaba.

**Metahri Mohammed Saïd, (2012),**Simultaneous elimination of nitrogen and phosphate pollution from wastewater treated by mixed processes. Case of the East STEP of the city of Tizi-Ouzo.

**Semester: 3**
**Teaching unit: UEF 1.3.**
**Subject UEF 1.3.3: Organization and mechanization of work**
**VHS: 67h0 (Class: 3h00, Tutorial: 1h30)**
**Credits: 6**
**Coefficient: 3**

**Teaching objectives**

The objectives assigned by this subject relate to the introduction of students to the various actions necessary for the organization and mechanization of work on hydraulic sites.

**Recommended prior knowledge**

Applied hydraulics, sanitation, hydraulic works.

**Content of the subject**

**Chapter 1 :Common vocabulary**

Construction site - Project manager and project owner, definitions and different - Contracts and legal aspect - Quotation - Specifications

**Chapter 2: Site installation**

Preparatory work - Clearing of rights-of-way - Sanitation, hydraulic protection and networks - Signs - Supports - Pickets and installations - Estimated work schedule - Execution phasing - Site installations

**Chapter 3: Earthworks**

General earthworks - Mass earthworks - Earthworks in excavations Earthworks in channels - Earthworks in trenches - Protection and shielding - Reduction of water tables and drainage

**Chapter 4: Laying pipes**

Criteria for choosing pipes depending on the nature of the terrain - Earthworks for pipes - Backfilling for pipes - Handling of pipes - Laying and assembly techniques - Leak-tightness tests and acceptance of works - Quality control

**Chapter 5: Hydraulic concretes**

General indications - Consistency of concrete - Dosages and compositions - Strength of concrete

Choice of composition materials - Manufacture of concrete - Transport, handling and workability - Admixtures - Tests and controls

**Evaluation mode:**

40% continuous assessment and 60% exam.

**Bibliographic references:**

**Jacques Armand,Yves Raffestin,Daniel Couffignal**: Preparation and organization of the site, planning and monitoring of the work, Edition Le Moniteur, 2001

**Ralph W. Fairbanks: Organization and mechanization of administrative work, Les Éditions D'Organization**

**Semester: 3**
**Teaching unit: UEM 1.3.**

**UEM 1.3.1 material:Diagnosis and rehabilitation of collection systems**
**VHS: 45h00 (Class: 1h30, Tutorial: 1h30)**
**Credits: 3**
**Coefficient: 2**

## Teaching objectives:

This course aims to teach master's students the methodology to follow to carry out a diagnosis of a sanitation system and to assess its performance in order to propose rehabilitation work.

## Recommended prior knowledge:

The contents of applied hydraulics as well as cartography and GIS must first be acquired.

## Content of the material:

**Chapter I: General**
Purpose of the study - Scope of the study - Description of the collective sanitation system
Documents and data provided to the service provider – Methodology

**Chapter II: Study of the current situation of a collection system**

**PHASE 1: Inventory of available data and pre-diagnosis of the sanitation system**
Data collection and analysis
Summary and proposals for investigation for the continuation of the study

**PHASE 2: Campaigns to measure flow rates and pollutant loads**
Content of measurement campaigns
Presentation of the results

**PHASE 3: Precise location of network anomalies and malfunctions**
Visual and television inspections (ITV)
Locating bad connections - dye tests and smoke tests

**PHASE 4: Assessment of the operation of the sanitation system – diagnosis**

**Chapter II: Rehabilitation of collection systems**

**Development of the collective wastewater sanitation master plan**
Collection networks and wastewater treatment plant
Self-monitoring and permanent diagnosis
Asset management
The sanitation regulations
Course of the study
Study management
Reports
Meetings
Health and Safety

## Evaluation method:

40% continuous assessment and 60% exam.

**Bibliographic references**:

**FG Brière.**Water distribution and collection, Presses Internationales Polytechnique, second edition, 2000.

**R.BOURRIER**. Sanitation networks, Edt. Lavoisier, Paris, 2008

**Web sites…**

**Semester: 3**
**Teaching unit: UEM 1.3.**
**UEM 1.3.2 material:Modeling of sanitation systems**
**VHS: 45h00 (Class: 1h30, TP: 1h30)**
**Credits: 3**
**Coefficient: 2**

## Teaching objectives:

This course aims to raise awareness among future executives of the problem of dynamic management of sanitation networks through a concrete and practical approach. A calculation code specific to sanitation networks (SWMM) is introduced for this purpose. Students must devote a few hours of independent work to achieve the educational objectives set. The evaluation of the projects submitted takes into account the spirit of initiative, critical thinking and the efforts made to achieve effective and economical solutions.

## Prior knowledge recommended:

The contents of applied hydraulics as well as cartography and GIS must first be acquired.

## Content of the material:

### Chapter I: Modeling of sanitation networks

Definition and objectives
Description of the relief space and urban planning aspects
Topological organization
Representation of the various typologies
Taking data from the archive
Elements of theory

### Chapter II: Modeling software (SWMM software)

Screen overview
Toolbar overview
Saving default settings
Create the network backbone
Create the hyetogram curve
Perform the simulation
View and analyze the results obtained
Calibration and validation

## Evaluation method:

40% continuous assessment and 60% exam.

## Bibliographic references:

**FG Brière.**Water distribution and collection, Presses Internationales Polytechnique, second edition, 2000.

**R.BOURRIER**. Sanitation networks, Edt. Lavoisier, Paris, 2008

**ROCK A**., EPA SWMM5 Software User Manual
Tutorial…

**Semester: 3**
**Teaching unit: UEM 1.3**
**UEM 1.3.3 material:Mini tutored project**
**VHS: 45h00 (TP: 3h00)**
**Credits: 3**
**Coefficient: 2**

## Teaching objectives:

The mini-tutored project is used to best support the student. The virtues of tutoring are such that the student develops critical thinking and curiosity..

## Recommended prior knowledge

Basic notions of hydraulics, topography, IT, applied hydraulics

## Content of the material:

A mini project (two per semester) / Internship (15 days) will be chosen during each semester by the student.

The mini project will affect the following areas:

- AEP
- Sanitation
- Site organization
- GIS
- Sizing a wastewater treatment plant
- Environmental impact study
- Preparation of estimated, quantitative and estimated quotes
- Preparation of price schedules
- Development of hydraulic specifications
- A theme proposed by the teacher
-

The internship will be carried out at the level of establishments agreed with the university and will be sanctioned by a report noted and discussed with the tutor teacher

Places :

ADE
WE HAVE
ABH
Hydraulic steering
State and private design offices

## Evaluation method:

Review: 100%

**Semester: 3**
**Teaching unit: UED 1.3.**
**Subject UED 1.3.1:Metrology and means of inspection in sanitation**
**VHS: 45h00 (Class: 1h30, tutorial: 1h30)**
**Credits: 2**
**Coefficient: 2**

**Teaching objectives:**

This course aims to raise awareness among future executives of the importance of measurements in the management and diagnosis of sanitation systems. Also introduce them to the equipment used for physical measurements, taking samples and inspecting collectors.

**Prior knowledge recommended:**

The content of the applied hydraulics must be acquired beforehand.

**Content of the material:**

**Chapter I:General**
Measurement campaign-preamble-description / location of measurement points-the duration of the campaigns and the content of the campaigns.

**Chapter II: Means implemented**
Human resources- the means of physical measurements - The means for taking samples - The means for inspecting the collectors (cameras, coring, georadar, etc.) - the hydro-cleaners.

**Chapter III: Investigation procedures**
Methods for implementing measures - intervention reports - technical procedures - exploitation of measurement results - Summaries and recommendations

**Evaluation method:**
40% continuous assessment and 60% exam.

**Bibliographic references**:
Catalogs from the diagnostic equipment supplier (HYDREKA)

**Semester: 3**
**Teaching unit: UET 1.3.**
**UET 1.3.1 material:Documentary research and dissertation design**
**VHS: 10:30 p.m. (Class: 1h30)**
**Credits: 2**
**Coefficient: 1**

**Teaching objectives:**

Give the student the necessary tools to search for useful information to better use it in their end-of-study project. Help them go through the different stages leading to the writing of a scientific document. Show him the importance of communication and teach him to present the work carried out in a rigorous and educational manner.

**Recommended prior knowledge:**

Writing methodology, Presentation methodology.

**Content of the subject:**

**Chapter I-: Documentary research**

Fundamentals of scientific research
Stages of scientific research
Documentary research tools on the web
Scientific research techniques and operators
Presentation of the bibliography

**Chapter II: Design of the dissertation**

Plan and stages of the dissertation
Writing techniques and standards
Workshop: Critical study of a manuscript
Oral presentations and defenses
How to avoid plagiarism?

**Evaluation method:**

Review: 100%

**Bibliographic references**:

**Kothari, CR (2004).**Research Methodology: Research and techniques, New Delhi: New Age International Publishers.

**Kumar, R. (2011).**Research Methodology: A step-by-step guide for beginners (3rd edition). London, UK: TJ International Ltd, Padstow, Cornwall

**Wallinman, N. (2006).**Your Research Project: A step-by-step guide for the first-time researcher. London: Sage Publications.

# VI - Opinions and Visas from Administrative and Consultative Bodies