

# MASTER IN WATER ENGINEERING A “SEMI-ATTENDANCE” UNIVERSITY-SPECIFIC DEGREE WITH INTERNATIONAL PARTICIPATION

L. Pozo-Morales<sup>1</sup>, J. Lebrato<sup>1</sup>, D. Garvi<sup>1</sup>, B. Jigena<sup>2</sup>, J.J. Muñoz<sup>2</sup>, J. Vidal<sup>2</sup>

<sup>1</sup> University of Seville (SPAIN)

<sup>2</sup> University of Cádiz (SPAIN)

## Abstract

The Water Engineering Master Course is a university-specific degree at the University of Seville which nowadays can be coursed in two different modalities: “on line” and “semi-attendance”. Its first edition took place at 2000 and since then, the average of graduated students has been of 40 students per course. The semi-attendance mode offers the possibility of being followed in an on-line way from November to June. A Moodle platform provides all the documentation that is required to attend every module, at the end of each one some online questionnaires are also uploaded in order to evaluate the students. Only one of the 10 mandatory modules which make up the course have to be attended in a classroom mode. It takes place during 15 days in July and allows the students to come into contact with the lecturers, professionals of the sector and their own mates as well. During this period both, teachers and students, are lodged in the same residence and all of them have the chance of interchanging experiences in a full teaching-learning process, solving doubts and improving their skills thanks to specific courses, specially designed in function of the lack of knowledge which has been detected during de previous modules, o even, the suggestions received directly from students. Most of the students come from Hispanic countries and in less amount from African and European countries. Actually every July about 80 students and teachers from 25 different countries around the world, meet in Seville to attend this Master. The classes are given in Spanish with translator support if it's necessary. Different environments, problematic and conditioning factors are studied and a large kind of solutions in water cycle are designed during these days. The requirements to elaborate the final master project are mainly that this one can be used to resolve a real local problem in the student's origin place and moreover the student can obtain better marks if he/she finds financing to carry it out. In the last 8 years a useful module named “Tools for design” has been included in the program of the Master in order to enable the student in IT, specifically spreadsheets, cad, software for budgeting and measurement, topography and decision support systems. Students who graduate are able to evaluate the most proper technology from a social, technic and economic point of view, as well as, select the most efficient alternatives in order to achieve a sustainable development.

Keywords: Water engineering, moodle, semi-attendance, teaching-learning.

## 1 WATER ENGINEERING MASTER COURSE

The Water Engineering Master Course is an university-specific degree at the University of Seville which nowadays can be coursed in two different modalities: “on line” and “semi-attendance”. Its first edition took place at 2000 and since then, the average of graduated students has been of 40 students per course.

Within the scientific field of Engineering and Architecture, its main subject area is Engineering and New Technologies, and its secondary area is Biotechnology, Sustainability, Ecology and Environment.

The first edition in classroom mode, took place in 2000. Since 2004, this mode was replaced by the semi-attendance modality, in which only 2 of the 13 modules/subjects that comprise the full contents of the master, must be mandatorily attended in person. The andalusian government funded the development of this new modality of Master during a few years.

The duration of this program is two academic years. Each year the students are being forced to perform one of two classroom modules. From 2006 it was offered likewise master mode on-line, in which non-attended modules are contemplated.

The aims of this Master is to provide the students with a knowledge of the situation and problems of water from an eminently practical perspective, adapted to different economic scales, that allows them to understand and analyse environmental management of this natural resource in the world. For this

existing water resources are analysed, their environmental situation, uses, production costs and as well as the main measures and legislative developments that have been approved in recent years to improve its management. It forms and trains students in the design, construction, maintenance, operation and management and other aspects of wastewater and drinking water.

The objective is to provide the following skills at the students:

- General knowledge of water issues and their possible assessments.
- Ability to choose the most appropriate methodology for water catchment, exploitation and utilization of water resource within its double aspect of hydric balance.
- Knowledge of the composition and properties of water, and physical and chemical phenomena that occur naturally, artificially or induced by the presence of pollutants.
- Knowledge of biological related to life in the water and its importance on the quality of water and its purification.
- Knowledge of the parameters indicators of physical chemical and biological water pollutants and techniques for their determination.
- Knowledge of conventional and unconventional techniques for treating drinking water and wastewater.
- Knowledge of potential risks associated with water treatment facilities and capacity to implement prevention plans and safety.
- Ability to choose from a social point of view, technical and economic viability choosing one technology or another.
- Ability to assess, from a comprehensive and multidisciplinary approach, different alternatives, and to choose between them efficiently, always within a framework of sustainable development.

The student / tutor ratio is 0.5.

Its content is taught in a total of 60 credits according to the following scheme (Table 1).

Table 1. Contents water engineering master.

MASTER IN WATER ENGINEERING			
ON LINE		SEMI-ATTENDANCE	
Module	ECTS	Module	ECTS
1. Aquatic environments study	4	1. Aquatic environments study	4
2. Properly treatments of the water	10	2. Properly treatments of the water	4
3. Processes design	10	3. Processes design	4
4. Building	5	4. Building	4
5. Environmental engineering	10	5. Social production of water and environment	4
6. Resource management	5	6. Tools for design	4
7. Water engineering specialization	4	7. Human development engineering	4
8. End-of-master project	12	8. Environmental health engineering	4
		9. Water and Soil for agriculture	4
		10. Resource management	4
		11. End-of-master project	12
		12. Introduction to water engineering (classroom mode, 1st year)	4
		13. Specialization in water engineering (classroom mode, 1st year)	4

Regarding to the teachers, in on line modality, about 42,86% are academic personal, both in University of Seville as in others Spanish and foreign universities. The 73,3% of them are PhD. The 57,14 % of the remaining teachers came from non academic institutions, as companies or free lances professionals, the 15% of them are PhD as well.

In semi-attendance modality, the 45,46% of the teachers are academic personal, both in University of Seville as in others Spanish and foreign universities. The 73,3% of them are PhD. The 55,54 % of the remaining teachers came from non academic institutions, as companies or free lances professionals, the 16,67 % of them are PhD as well.

The high percentage of non-academic teachers gives the Master in Water Engineering a strong professional character and allows to the students to provide a training connected with the industrial reality.

All the contents of the Master in water engineering are included and available at the web page<sup>1</sup> [www.aguapedia.org](http://www.aguapedia.org), a free access web where everybody can download them from.

## **2 SEMI-ATTENDANCE MODALITY**

Our students must follow the different modules in an on-line way from November to June.

A Moodle platform provides all the documentation that is required to attend every module, at the end of each one some online questionnaires are also uploaded in order to evaluate the students.

Each module of the master begins with a videoconference (moodle, open meeting) provided by the module teacher coordinator. At that moment, this teacher like the rest of teachers assigned to each module stay in contact with the students by internet forum or e-mail in order to solve the questions that the students make. The videoconference is previously fixed, hours and dates.

Only one of the mandatory modules which make up the course have to be attended in a classroom mode, per year. It takes place during 15 days in July and allows the students to come into contact with the lecturers, professionals of the sector and their own mates as well.

During this period both, teachers and students, are lodged in the same residence and all of them have the chance of interchanging experiences in a full teaching-learning process, solving doubts and improving their skills thanks to specific courses, specially designed in function of the lack of knowledge which has been detected during de previous modules, o even, the suggestions received directly from students.

They are carried out laboratory practices, self workshops, technical workgroups projects, program of visits to water treatment facilities and institutions related to the complete water cycle facilities.

For accommodation and care of students and teachers, and the development of classes, infrastructure such as classrooms, office, laboratory, workshop self, experimental fields, residence, dining, entertainment and pool, are available.

In terms of material resources it has: Teaching materials in classrooms, laboratory equipment and workshops, Moodle platform documentation accessible master and visiting program.

## **3 RESULTS**

Actually every July about 80 students and teachers from 25 (Photo 1) different countries around the world, meet in Seville to attend this Master. Most of the students come from Hispanic countries and in less amount from African and European countries.

Different environments, problematic and conditioning factors are studied and a large kind of solutions in water cycle are designed during these days.



Photo 1.

Year by year it has pursued an ambitious program of classes and that within 15 days, answer is given to the following objectives:

- Rinse all kinds of doubts and questions about the modules already studied in this course.
- Study in depth of the modules mentioned in the previous point.
- Conduct visits illustrative agendas studied.
- Conduct pilot experiences, practices and laboratory tests to obtain conclusive results about these experiences and initials for future projects Final Masters.
- Start the study of outstanding modules of the next academic year 2011/2012, facilitating the work ahead for the students to meet the course.

With these assumptions and taking into account the time available and the diversity of training of origin of each of the students, the work programs raised during this period contemplate simultaneous face different kinds of materials, so that students select and attend those it considers of greatest interest, according to the objectives described, provided a workbench at the end of each day, where they can share the knowledge acquired in the lectures, workshops and courses attended and experimental results, and benefit thus enriching the working group.

Especially useful were the modules 6 (Tools for design) and 11 (Final Master Project).

“Tools for design” has been included in the program of the Master in the last 8 years in order to enable the student in IT, specifically spreadsheets, cad, software for budgeting and measurement, topography and decision support systems. Especially the students has been instructed in handling design tools Water Engineering processes such as Autocad, CATIA, Design of WWTP, Arc GIS, Epanet, Swwm, Presto, Inventor.

By the other hand, the requirements to elaborate the final master project are mainly that this one can be used to resolve a real local problem in the student’s origin place and moreover the student can obtain better marks if he/she finds financing to carry it out.

Students who graduate are able to evaluate the most proper technology from a social, technic and economic point of view, as well as, select the most efficient alternatives in order to achieve a sustainable development.

Experience reports coexistence and cooperation with students from some 20 countries, which are pooled multitude of related experiences integral water cycle.

## **4 CONCLUSIONS**

Master's interest lies in finding necessary and possible in the integrated water cycle in most environments world solutions, through appropriate technologies in every situation.

The large number of participants from different nationalities on each course, involves the sharing of problems and very different challenges for each context, which contributes to the dynamic learning processes that cross borders.

They are learned and developed strategies supra water management and treatment systems with energy-efficient technologies.

## **REFERENCES**

[1] [www.aguapedia.org](http://www.aguapedia.org)