

POSTGRADUATE STUDIES

18th INTERNATIONAL MASTER'S IN
THEORETICAL & PRACTICAL APPLICATION OF
FINITE ELEMENT METHOD AND CAE
SIMULATION

COURSE GUIDE

2012

SUPERIOR TECHNICAL SCHOOL OF
MECHANICAL ENGINEERS
(U.N.E.D)

INGECIBER, S.A.

COURSE GUIDE

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INTERNATIONAL MASTER'S IN THEORETICAL & PRACTICAL APPLICATION OF FINITE
ELEMENT METHOD AND CAE SIMULATION

I COURSE OVERVIEW

I.1 JUSTIFICATION

Computer Aided Engineering (C.A.E), within what has been called Computer Integrated Manufacturing (C.I.M), constitutes an important aspect in the whole process and it is able to ensure the fulfillment of the quality requirements that today's industrial society demands. In those aspects concerning quality and technical analysis, the Finite Element Method (F.E.M) is shown to be the most used today, which involves a continuous increasing demand of technical experts who are able to use it effectively.

So, it is evident that there is a need for additional training in F.E.M for both recent technical graduates and working professionals, which implies a serious updating of knowledge in these New Technologies.

The experience of the previous seventeen Master's editions, in which more than 2,500 students have participated, proves unmistakably that the course has obtained wide acceptance. This wide number of students is also recognition of the prestige of the program.

Over the years, the MSc's syllabus has been expanded with new optional specialized modules and with the improvement of the subjects' contents as well as the system required by distance e-learning methodology. In addition, the latest versions of FEM software have always been used, with new user interfaces, new elements, algorithms and solution methods... All of which permit us to address the objective in professional practice.

Furthermore, the world wide interest received for this Master has motivated us to use English and Spanish as lingua franca, making the study of this course possible from any part of the globe. In addition, the undoubted communication advantages of the

Internet have encouraged us to do an on-line Master, using a resource in which UNED is pioneer.

Consequently, it is necessary to highlight the practical aspects which are an indispensable complement of theoretical training. This allows the immediate application of the acquired knowledge to the professional practice within the work environment.

Finally, it is necessary to specify explicitly the course interest in practical and theoretical aspects which enable the immediate application of the acquired knowledge to the work environment.

I.2 OBJECTIVES

The objective of the program is the training of specialized engineers in the basics and in the use of Finite Element Method (F.E.M) through Computer Aided Engineering technologies, and its immediate professional practical application.

In short, it is possible to list the five main objectives:

1. The Expert Module provides the key understanding of FEM, in order to have a solid foundation to develop further at more advanced levels (specialized modules).
2. The introduction to the finite element software by managing Patran/Nastran of MSC, CivilFEM and CFD++. Students will also have at their disposal the student version of Patran/Nastran of MSC, CivilFEM and CFD++ software during term time (the corresponding software will be provided according to the modules in which the student has enrolled).
3. Practice examples that provide a real useful experience in the workplace.
4. Different texts and proposed exercises provide strong studying material.

5. The combination between mandatory and optional subjects facilitates the enlargement of these subjects, so that the student can adapt the training to their personal interest. To this end, the program has been structured in three different levels belonging to three different diplomas; as will be seen in the guide.

I.3 COURSE STRUCTURE

Each module, except the Master's thesis, consists of a list of subjects that can be grouped in three types:

1. Foundations: basic and theoretical subjects.
 2. Application: practice program teaching for each module.
 3. Practice: in this module, it is intended to consolidate the acquisition of knowledge in the corresponding subjects through instances realization and exercises, addressing real problems which provide experience. The goal is that the students acquire the knowledge needed and practice for the method's use in their professional life.
- **Expert Module** (mandatory) – 30 credits

The Expert Module is the initial and basic module that all students must take in order to obtain any of the three degrees. The completion of this module is necessary to achieve the **Expert title**.

The Expert Module has two specialized branches: *Mechanical Branch and Construction Branch*. The student must choose between these two. The content of both specialties is described in the specific guides of each section.

- **Specialized Modules** (optional)- 10 credits

The completion of the *Expert Module* and, at least, one specialized module is being rewarded with the **Specialist diploma**.

Module A: Dynamic Analysis - 10 credits

Module B: Nonlinear Analysis - 10 credits

Module C: Heat Transfer - 10 credits

Module E: Advanced Steel Structures Calculation - 10 credits

Module F: Fluid Mechanics - 10 credits

Module H: Advanced Concrete Structures Calculation - 10 credits

Module I: Geotechnical Expansion – 10 credits

Module J: Electromagnetic Calculation -10 credits

- Specialized Modules Groups

The specialized module groups are the following:

- Structural Speciality: Modules A, B and E
- Mechanical Speciality: Modules A,B,C,F and J (*)
- Construction Speciality: Modules A,B,E,H and I(*)

(*) Student must choose 3 of the 5 modules.

- **Final Project Module** (optional) – 10 credits

The successful completion of the *Master's Thesis* after having completed the *Expert Module* and, at least, three *Specialized Modules* (grouped in the same specialized module group), will be rewarded with the **Master title**.

Notes:

1. Taking the appropriate modules, students have up to five years to qualify for the degree they want. However, each module in which students enroll must be taken

and must be passed the same year. Otherwise, students must re-enroll in following years if they want to continue.

2. Students can enroll a maximum of 60 credits corresponding to different modules in a year, so, at least, two years are necessary to achieve the Master's degree.

3. Students have to complete first the *Expert Module* in order to attend the *Specialized Modules*. Furthermore, in order to attend and present the *Final Project*, students must complete the *Expert Module* and a specialized modules group (with three modules).

4. In addition, students have the possibility to remain enrolled in other Specialized Modules of their interest apart from the *Specialized Module Groups* studied.

5. It has been estimated that each credit represents approximately a 10 hours of workload.

I.4 SUBJECTS AND CREDITS

The subjects which constitute the different Modules are the following:

Expert Module

AF Module: Theoretical Basis

- *AF.1. - F.E.M. General Theory
- *AF.2. –FEM Programming Introduction
- *AF.3. - Numerical Calculation
- *AF.4. - Material Behaviour Laws

AP Module: Application and Practice – Division between the *Construction Branch* and the *Mechanical Branch*

- *AP.1. – Introduction in the Use of Practical Software.
- *AP.2. –Computer-Aided Engineering Techniques.
- *AP.3. – Mechanical or Civil Practical Software Examples

Specialized Modules

Module A: Dynamic Analysis

- *A.1. - F.E.M. Theory Applied to The Structure Dynamic Analysis.
- *A.2. –Introduction to Dynamic Analysis with Practical Software.
- *A.3. - Dynamic Analysis Practices.

Module B: Nonlinear Analysis

- *B.1. –FEM Theory Applied to Non-Linear Structures Calculation.
- *B.2. –Introduction to Non-Linear Analysis with Practical Software.
- *B.3. - Nonlinear Analysis Practices.

Module C: Heat Transfer

- *C.1. - F.E.M. Theory Applied to Heat Transfer.
- *C.2. –Introduction to Heat Transfer Analysis with Practical Software.
- *C.3. - Heat Transfer Practices.

Module E: Metallic Structures

- *E.1. –Steel Structure Advanced Calculation.
- *E.2. –Introduction to Steel Structure Analysis with Practical Software.
- *E.3. - Metallic Structures Practices.

Module F: Fluid Mechanic

- *F.1. - F.E.M. Theory Applied to Fluid Mechanics.
- *F.2. –Introduction to Fluid Mechanic Analysis with Practical Software.
- *F.3. - Fluid Mechanic Practices.

Module H: Advanced Concrete Structures Calculation

- *H.1. –Advanced Calculation of Concrete Structures.
- *H.2. –Introduction to Concrete Structures Analysis with Practical Software
- *H.3. - Concrete Structures Practices.

Module I: Geotechnical Expansion

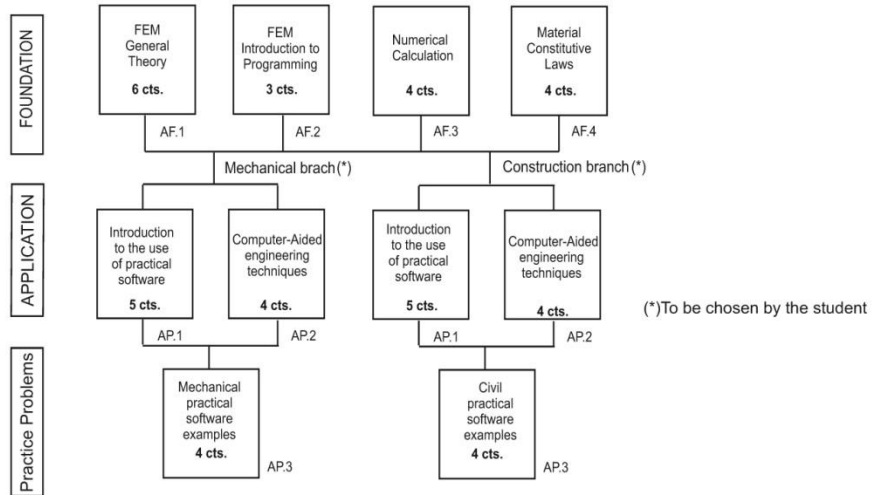
- *I.1. - FEM Theory Applied to Geotechnics.
- *I.2. – Introduction to Geotechnical Analysis with Practical Software.
- *I.3. - Geotechnical Practices.

Module J: Electromagnetic Calculation

- *J.1. –FEM Theory Applied to Low Frequency Electromagnetic Analysis.
- *J.2. –Introduction to EMAG Analysis with Practical Software.
- *J.3. –EMAGPractices.

Final ProjectModule

EXPERT MODULE (30 cts)



SPECIALIZED MODULES (10 cts by module)

| | Module A | Module B | Module C | Module E | Module F | Module H | Module I | Module J |
|--------------------------|---|---|--|--|--|--|---|---|
| FOUNDATION | FEM theory applied to structure dynamic analysis 4 cts. A.1 | FEM theory applied to the nonlinear analysis of structures 4 cts. B.1 | FEM theory applied to heat transfer 4 cts. C.1 | Advanced steel structures Analysis 4 cts. E.1 | FEM theory applied to fluid mechanics 4 cts. F.1 | Advanced concrete structures analysis 4 cts. H.1 | FEM theory applied to Geotechnics 4 cts. I.1 | FEM theory applied to low frequency electromagnetic analysis 4 cts. J.1 |
| APPLICATION | Introduction to Dynamic analysis with practical software 4 cts. A.2 | Introduction to: Non-linear analysis with practical software 4 cts. B.2 | Introduction to: Heat transfer analysis with practical software 4 cts. C.2 | Introduction to: Steel structure analysis with practical software 4 cts. E.2 | Introduction to: Fluid mechanics analysis with practical software 4 cts. F.2 | Introduction to: Concrete structures analysis with practical software 4 cts. H.2 | Introduction to: Geotechnical analysis with practical software 4 cts. I.2 | Introduction to: EMAG analysis with practical software 4 cts. J.2 |
| Practice Problems | Dynamic Analysis Practice Problems 2 cts. A.3 | Non-linear analysis Practice Problems 2 cts. B.3 | Heat transfer Practice Problems 2 cts. C.3 | Metallic structures Practice Problems 2 cts. E.3 | Fluid Mechanics Practice Problems 2 cts. F.3 | Concrete structure Practice Problems 2 cts. H.3 | Geotechnical Practice Problems 2 cts. I.3 | EMAG Practice Problems 2 cts. J.3 |

SPECIALIZED MODULES GROUPS

- Structural: Construction Branch and A, B and E Modules
- Construction: Construction Branch and A, B, E, H and I Modules*
- Mechanical: Mechanical Branch and A, B, C, F and J Modules*

* Choose three of the five modules

NOTE: I & J modules will not be available for students that have coursed the Master with Patran/MSC Nastran or CivilFEM with Marc respectively.

FINAL PROJECT MODULE (10 cts)

I.5 DEGREES

The following awards will be granted on successful completion of the different Master's levels:

-Expert in Theoretical and Practical Application of Finite Element Method (The students must take the Expert Module).

- Specialist in Theoretical and Practical Application of Finite Element Method and Simulation (The students must take the Expert Module and one Specialized Module).

- Master's in Theory and Practical Application of Finite Element Method and Simulation (The students must take the Expert Module, one of the specialized modules groups and the final project of the Master's).

Diplomas are issued by UNED university of Spain. To access this postgraduate course, at least, an EHEA Bachelor's degree is required (*grado EEES*)

I.6 AWARDS

Distance Learning National University, through its Superior Technical School of Industrial Engineers, will reward the best MSc's final project presented in the program. The award will consist of public recognition of the student's study and the reimbursement of the enrollment fees for the master's Final Project. The contest rules are in the mechanical or civil student guide.

I.7 METHODOLOGY

The program is characterized by UNED's own methodology which is based on distance learning. This allows students to follow the course regardless their place of residence and to make their work and family responsibilities compatible.

Distance learning key elements are:

- **Teaching material:** specially prepared for the program and selected bibliography to study. These are texts for Foundations, Application and Practical subjects as well as the proposed exercises.
- **Software:** students will have access throughout the course to Patran/Nastran of MSC, CivilFEM and CFD++ software with educational license to practice and fulfill the theoretical training. This software is in 3D and includes a library of all its elements and types of analysis.
 - The minimum computer requirements for the practice programs are the market standards.
 - The installation and configuration instructions for the proper use of the software can be found in the virtual classroom.
- **Virtual classroom:** provides the students the chance to interact with each other and with professors, and to make different consultations. Also, the teaching material (proposed exercises), tutorships, installation technical assistance and the management of secretarial duties are found here. In order to use this tool, it is necessary to have a good Internet connection.
- **Tutorships:** mainly driven by the virtual classrooms.
- **Self-evaluation exercises:** training exercises and their solutions are offered through the virtual classroom in order to check the acquired subject knowledge.
- **Continuous assessment exercises:** these are set out in the different modules through the virtual classroom, and must be resolved and sent to the professor.
- **Exams:** distance test questions and practical exercises.
- **Video-lessons:** specific sessions about the subject of each module given by the professor.

I.8 DURATION AND TIMETABLE

The date set for the inaugural session is the following:

Inaugural session: Saturday 24th March, 2012, from 11:00am to 2:00pm.

The place of the inaugural session will be communicated to students sufficiently in advanced; it can be also followed through the virtual classroom.

In the following timetable, the number of teaching hours corresponding to each subject as well as the transmission of documents is specified for each week of the program (defined by months and the dates of the Mondays). It is necessary to highlight the fact that a credit supposes a workload of 10 hours approximately, and a teaching hour is equal to an hour of class. The bold empty weeks correspond to holiday periods or public holidays

TIMETABLE OF THE 18TH MASTER'S EDITION (2012) (Distribution of recommended weekly studying hours and weeks of tutorship)

MECHANICAL BRANCH

| WEEK | | MARCH 2012 | | | | APRIL 2012 | | | | | MAY 2012 | | | | JUNE 2012 | | | | JULY 2012 | | | | | |
|---|------|------------|----|----|-------------------|------------|-----|-----|-----|------------------|----------|-----|-----|----------------|-----------|----|----|------|-----------|------|----|----|----|--|
| | | 5 | 12 | 19 | 26 | 2 | 9 | 16 | 23 | 30 | 7 | 14 | 21 | 28 | 4 | 11 | 18 | 25 | 2 | 9 | 16 | 23 | 30 | |
| EXPERT MODULE | | | | | | | | | | | | | | | | | | | | | | | | |
| FEM General Theory | AF.1 | | | S | 6 ST | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | | | | |
| FEM Introduction to programming | AF.2 | | | S | | | | | | | | | | | | | | | | 4 ST | 4 | 4 | 4 | |
| Numerical Calculation | AF.3 | | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | |
| Material constitutive laws | AF.4 | | | S | | | | | | | | | | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| Introduction to the use of practical software | AP.1 | | | S | 7.5 ST | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | | | | | | | | | | | |
| Computer-Aided engineering techniques | AP.2 | | | S | | | | | | | | | | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| Practice problems | AP.3 | | | | | | | | | | | | | | | | | S | 5 ST | 5 | 5 | 5 | 5 | |
| SPECIALIZED MODULES | | | | | | | | | | | | | | | | | | | | | | | | |
| FOUNDATIONS (A.1, B.1, C.1, E.1, F.1, H.1, I.1,J.1) | | | | | | | | | | | | | | | | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | |
| APPLICATION (A.2, B.2, C.2, E.2, F.2, H.2, I.2,J.2) | | | | | | | | | | | | | | | | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | |
| PRACTICE PROBLEMS (A.3, B.3, C.3, E.3, F.3, H.3, I.3,J.3) | | | | | | | | | | | | | | | | | | | | | | | | |
| FINAL PROJECT MODULE | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | Application F.P.M | | | | | Allocation F.P.M | | | | Starting F.P.M | | | | | | | | | | |

S: DOCUMENTATION SENT; ST: START OF TUTORSHIP TUTORSHIP

TIMETABLE OF THE 18TH MASTER'S EDITION (2012) (Distribution of recommended weekly studying hours and weeks of tutorship)

MECHANICAL BRANCH

| WEEK | | AUGUST 2012 | | | SEPTEMBER 2012 | | | | OCTOBER 2012 | | | | | NOVEMBER 2012 | | | DECEMBER 2012 | | | | | |
|---|------|-------------|--|--|----------------|----|----|----|--------------|----|-------------------|-----|----|---------------|----|------|---------------|---|---|---|---|--|
| | | | | | 3 | 10 | 17 | 24 | 1 | 8 | 15 | 22 | 29 | 5 | 12 | 19 | 26 | 3 | | | | |
| EXPERT MODULE | | | | | | | | | | | SEE | REE | | | | SEE* | REE* | | | | | |
| FEM General Theory | AF.1 | | | | | | | | | ET | | | | | | | | | | | | |
| FEM Introduction to programming | AF.2 | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | | | | | | |
| Numerical Calculation | AF.3 | | | | | | | | | | ET | | | | | | | | | | | |
| Material constitutive laws | AF.4 | | | | 4 | 4 | 4 | 3 | 3 | 3 | 3 | | | | | | | | | | | |
| Introduction to the use of practical software | AP.1 | | | | | | | | | | ET | | | | | | | | | | | |
| Computer-Aided engineering techniques | AP.2 | | | | 4 | 4 | 4 | 3 | 3 | 3 | 3 | | | | | | | | | | | |
| Practice problems | AP.3 | | | | 5 | 5 | 6 | 6 | 6 | 6 | 6 | | | | | | | | | | | |
| SPECIALIZED MODULES | | | | | | | | | | | | | | | | SEE | REE | | | | | |
| FOUNDATIONS (A.1, B.1, C.1, E.1, F.1, H.1, I.1,J.1) | | | | | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| APPLICATION (A.2, B.2, C.2, E.2, F.2, H.2, I.2,J.2) | | | | | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| PRACTICE PROBLEMS (A.3, B.3, C.3, E.3, F.3, H.3, I.3,J.3) | | | | | | | | S | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| FINAL PROJECT MODULE | | | | | | | | | | | Delivery of F.P.M | | | | | | | | | | | |

: TUTORSHIP
 ET: END OF TUTORSHIP
 SEE: EVALUATION EXAM SENT;
 REE: RETURN OF EVALUATION EXAM
 *EXTRAORDINARY CALL OF THE EXPERT MODULE

TIMETABLE OF THE 18TH MASTER'S EDITION (2012) (Distribution of recommended weekly studying hours and weeks of tutorship)

CONSTRUCTION BRANCH

| WEEK | MARCH 2012 | | | | APRIL 2012 | | | | | MAY 2012 | | | | JUNE 2012 | | | | JULY 2012 | | | | | | |
|---|------------|----|----|---------|-------------------|---|----|----|------------------|----------|----|----|----------------|-----------|----|----|----|-----------|---------|----|----|----|---|--|
| | 5 | 12 | 19 | 26 | 2 | 9 | 16 | 23 | 30 | 7 | 14 | 21 | 28 | 4 | 11 | 18 | 25 | 2 | 9 | 16 | 23 | 30 | | |
| EXPERT MODULE | | | | | | | | | | | | | | | | | | | | | | | | |
| FEM General Theory | AF. 1 | | S | 7 ST | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 4 | 4 | 4 | 4 | 4 | | | | | | |
| FEM Introduction to programming | AF.2 | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | | | | | | | | | | |
| Numerical Calculation | AF.3 | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | |
| Material constitutive laws | AF.4 | | S | | | | | | | | | | | 4 ST | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| Introduction to the use of practical software | AP.1 | | | | | | | | | | | S | 7 ST | 7 | 7 | 7 | 7 | 7 | 10 | 10 | 10 | 10 | | |
| Computer-Aided engineering techniques | AP.2 | | | | | | | | | | | | | | | | | S | 5 ST | 5 | 5 | 5 | 5 | |
| Practice problems | AP.3 | | | | | | | | | | | | | | | | | S | 5 ST | 5 | 5 | 5 | 5 | |
| SPECIALIZED MODULES | | | | | | | | | | | | | | | | | | | | | | | | |
| FOUNDATIONS (A.1, B.1, C.1, E.1, F.1, H.1, I.1,J.1) | | | | | | | | | | | | | | | | | S | 4 ST | 4 | 4 | 4 | 4 | 4 | |
| APPLICATION (A.2, B.2, C.2, E.2, F.2, H.2, I.2,J.2) | | | | | | | | | | | | | | | | | | | | | | | | |
| PRACTICE PROBLEMS (A.3, B.3, C.3, E.3, F.3, H.3, I.3,J.3) | | | | | | | | | | | | | | | | | | | | | | | | |
| FINAL PROJECT MODULE | | | | | Application F.P.M | | | | Allocation F.P.M | | | | Starting F.P.M | | | | | | | | | | | |

S: DOCUMENTATION SENT; ST: START OF TUTORSHIP TUTORSHIP

TIMETABLE OF THE 18TH MASTER'S EDITION (2012) (Distribution of recommended weekly studying hours and weeks of tutorship)

CONSTRUCTION BRANCH

| WEEK | | AUGUST 2012 | | | SEPTEMBER 2012 | | | | OCTOBER 2012 | | | | | NOVEMBER 2012 | | | DECEMBER 2012 | | | | | |
|---|------|-------------|--|--|----------------|----|----|----|--------------|----|-------------------|-----|-----|---------------|-----|------|---------------|---|--|--|--|--|
| | | | | | 3 | 10 | 17 | 24 | 1 | 8 | 15 | 22 | 29 | 5 | 12 | 19 | 26 | 3 | | | | |
| EXPERT MODULE | | | | | | | | | | | SEE | REE | | | | SEE* | REE* | | | | | |
| FEM General Theory | AF.1 | | | | | | | | | ET | | | | | | | | | | | | |
| FEM Introduction to programming | AF.2 | | | | | | | | | ET | | | | | | | | | | | | |
| Numerical Calculation | AF.3 | | | | | | | | | ET | | | | | | | | | | | | |
| Material constitutive laws | AF.4 | | | | 4 | 4 | 4 | 3 | 3 | 3 | ET | | | | | | | | | | | |
| Introduction to the use of practical software | AP.1 | | | | | | | | | ET | | | | | | | | | | | | |
| Computer-Aided engineering techniques | AP.2 | | | | 5 | 5 | 6 | 6 | 6 | 6 | ET | | | | | | | | | | | |
| Practice problems | AP.3 | | | | 5 | 5 | 6 | 6 | 6 | 6 | ET | | | | | | | | | | | |
| SPECIALIZED MODULES | | | | | | | | | | | | | | | | SEE | REE | | | | | |
| FOUNDATIONS (A.1, B.1, C.1, E.1, F.1, H.1, I.1,J.1) | | | | | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | ET | | | | | |
| APPLICATION (A.2, B.2, C.2, E.2, F.2, H.2, I.2,J.2) | | | | | | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | ET | | | | | |
| PRACTICE PROBLEMS (A.3, B.3, C.3, E.3, F.3, H.3, I.3,J.3) | | | | | | | | | | | S | 7.5 | 7.5 | 7.5 | 7.5 | ET | | | | | | |
| FINAL PROJECT MODULE | | | | | | | | | | | Delivery of F.P.M | | | | | | | | | | | |

: TUTORSHIP
 ET: END OF TUTORSHIP
 SEE: EVALUATION EXAM SENT;
 REE: RETURN OF EVALUATION EXAM
 *EXTRAORDINARY CALL OF THE EXPERT MODULE

I.9 TUTORSHIPS

The tutorships will be given in English except in those regions where there is a tutor who speaks the corresponding language. The availability of specific tutorships in different regions will be communicated to students.

Tutorships will mainly be implemented through the virtual classroom, although it will be possible to make queries (by telephone, e-mail or face-to-face) to the course teaching staff during working hours. Each subject will have four hours of weekly tutorships. The student must pay attention to the professor's instructions.

Contact details of professors are indicated in the specific guide of the Mechanical or Civil Branch.

I.10 EVALUATION

As well as using considerations arising from direct contact through the tutorships and the virtual classroom, the student evaluation will be made by means of:

1- Online exams: the following exercises will be carried out:

- A test belonging to the *Expert Module* subjects which will consist of 30 multiple-choice questions (75% of the exam value) and a practical exercise (25% of the exam value).
- A test belonging to each of the Specialized Modules which will consist of multiple-choice questions (2/3 of the exam mark) and a practical exercise (1/3 of the exam mark).

In order to successfully pass the exam, it is necessary to obtain a minimum mark of 4 out of 10 in the practical exercise.

These exams will be available through the virtual classroom.

For the Expert Module, those students who failed or did not take the exam in the first sitting will take an extraordinary exam.

EXAMS TIMETABLE

| | Start date for evaluation | End of the evaluation |
|---|---|---|
| EVALUATION (EXPERT MODULE) | Monday 22 st October, 2012 | Monday 29 th October , 2012 |
| EVALUATION (<i>SPECIALIZED MODULES</i> and extraordinary call of the <i>Expert Module</i>) | Monday 26 th November, 2012 | Monday 3 rd December, 2012 |

2- Continuous assessment exercises: the aim of these exercises is to cover diverse and interesting functions in a Distance Learning system among which it is necessary to highlight:

- As a utility to settle ideas and to clarify concepts relating to the contents.
- As an aid element to establish teacher/student communication channels.
- As a means of self-assessment.
- As a means of assessment by the professor.

In order that this evaluation characteristic does not distort the remaining specified functions, it is interesting to note that the completion of the exercises included in the exercise book, can only have a positive influence on the score of the final module.

These exercises, which are available in the virtual classroom, will be sent through the enabled tools in the virtual classroom.

It is advisable to gradually send the remote evaluation exercises as the student advances in the study of the subject with the purpose of converting the study in a process of continuous training.

3- Master's Final Project: It will be directed by some of the professors of the program and qualified by a committee appointed by the Master's Directorate.

I.11 DIRECTORATE AND PROFESSORS' TABLE

Director:

Mr. Juan José Benito Muñoz. *Construction Engineering and Manufacturing Department, School of Mechanical Engineers, UNED.*

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II VIRTUAL CLASSROOM

II.1 INTRODUCTION

Throughout the last decade, the importance that Internet has acquired as an information exchange and the ease of access to the web place it as the best means to establish a teaching-learning environment in the image of a conventional university classroom. By making the following tools available for students:

- A distance learning flexibility
- Communication with other students and with professors and tutors
- Notice board
- Access to update teaching material
- Video-lessons, face-to-face sessions
- Etc.

For the purpose of generating the teaching-learning environment on the web, it is necessary to group under the same format a set of tools that allow us to do all the activities resulting from the normal development of a postgraduate course. UNED and INGECIBER have adopted the teaching platform for this course WebCT, which contains all the features and tools in a friendly framework and is easy to use.

Through this virtual classroom, students will be provided with the essential information to follow the program.

II.2 LOG IN INSTRUCTIONS

Because the virtual classroom is available through the Internet, it will be necessary to have access to follow the course.

To access the virtual classroom, you must go to:

<http://virtual0.uned.es/aut/inicioval.html>

The user name and password will be assigned and sent to each student at the beginning of the course.

II.3 CONTENTS AND STRUCTURE

The program is organized by modules, which have assigned their corresponding virtual classrooms. These classrooms are the communication tool for dealing with the corresponding topics of the modules' subjects between students, professors and tutors.

In these modular virtual classrooms the following tools are found:

- Teaching material of the module.
- Self-assessment tools (where appropriate).
- Remote evaluation tools (where appropriate).
- Professors and tutor's communications.
- Exams

Besides, there is a general space, common for all students, called "Course General Content", in which are found the following tools:

- Communications from the course management.
- Guide to the course.
- Software Installation instructions.
- Links with the inaugural session.
- Communication tools:
 - Direction and coordination board: Program director and program coordinator's communiqués.
 - Secretariat forum: communication with the program secretariat.
 - Technical assistance forum: Direct communication with the person in charge of resolving problems regarding software installation and the use of the virtual classroom.
 - Students' forum: is geared for the exchange of views.
- Video-lessons.