

GENERAL INFORMATION

| Course information 1 | |
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| Name | Master Thesis |
| Code | TFM |
| Degree | Master in the Electric Power Industry (MEPI) |
| Year | 1 st |
| Semester | Annual |
| ECTS credits | 6 ECTS |
| Type | Final Master Project |
| Department | Electrical Engineering |
| Area | Power Systems |
| Coordinator | Luis Olmos Camacho |

| Course information 1 | |
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| Name | EMIN Master's Thesis Extension |
| Code | TFM |
| Degree | Master in the Electric Power Industry (MEPI) |
| Year | 1 st |
| Semester | Annual 2 nd year EMIN |
| ECTS credits | 24 ECTS |
| Type | Elective |
| Department | Electrical Engineering |
| Area | Power Systems |
| Coordinator | Luis Olmos Camacho |

| Instructor | |
|--------------|---|
| Name | Luis Olmos Camacho |
| Department | Electrical Engineering |
| Area | Regulation and Economics of Energy |
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| Office hours | Arrange an appointment through email. |

DETAILED INFORMATION

Contextualization of the course

Contribution to the professional profile of the degree

The objective of the Master's Thesis is that the student demonstrates that she/he has reached the professional skills required to earn the Master degree. The outcome of this course will be a Master's Thesis Dissertation that will describe the work done and that may provide a starting point for further work.

Prerequisites

There are not any specific prerequisites for this subject.

CONTENTS

Contents

Theory

Procedures to be followed for the master thesis and internship

- 1.1. Academic structure
- 1.2. Why a Master's Thesis?
- 1.3. Division of tasks
- 1.4. Format
- 1.5. Thesis evaluation
- 1.6. Deadlines
- 1.7. Internship

Definition of thesis and internship topics

- 2.1. Collection of proposals from companies/universities
- 2.2. Refinement of these
- 2.3. Presentation of topics to students
- 2.3. Allocation of topics

Monitoring of the progress made with the thesis work

- 3.1. Presentations by students
- 3.2. Definition of changes to the planning of the thesis work

Master Thesis Defense

- 4.1. MEPI theses
- 4.2. EMIN theses

Competences and Learning Outcomes

Competences

General Competences / Basic Competences

- CG4. Ser capaces de predecir y controlar la evolución de situaciones complejas mediante el desarrollo de nuevas e innovadoras metodologías de trabajo adaptadas al ámbito científico/investigador, tecnológico o profesional concreto, en general multidisciplinar, en el que se desarrolle su actividad.
- CG5. Saber transmitir de un modo claro y sin ambigüedades a un público especializado o no, resultados procedentes de la investigación científica y tecnológica o del ámbito de la innovación más avanzada, así como los fundamentos más relevantes sobre los que se sustentan.
- CG6. Haber desarrollado la autonomía suficiente para participar en proyectos de investigación y colaboraciones científicas o tecnológicas dentro de su ámbito temático, en contextos interdisciplinares y, en su caso, con una alta componente de transferencia del conocimiento.
- CG7. Ser capaces de asumir la responsabilidad de su propio desarrollo profesional y de su especialización en uno o más campos de estudio.

Specific Competences

- CMT1. Realización, presentación y defensa, una vez obtenidos todos los créditos del plan de estudios, de un ejercicio original realizado individualmente ante un tribunal, consistente en un Trabajo Fin de Máster (Masters Thesis) de naturaleza profesional en el que el alumno pueda demostrar que ha adquirido e integrado las competencias propias en las enseñanzas.
- CMT2. For those students taking the Master Thesis Extension: Demostrar la capacidad de elaborar un estudio original de mayor alcance de acuerdo a las expectativas del programa Erasmus Mundus EMIN o programa equivalente, presentando este trabajo en un evento internacional ante profesorado de las diferentes Universidades del Consorcio EMIN.

Learning outcomes

Upon the completion of the Master's Thesis, the students will have to be able to:

- LO1. Present clearly and without ambiguities, both in the written document and in a public defense, the motivation and relevance of the selected topic, and the objectives and scope of the Master's Thesis.
- LO2. Present clearly and without ambiguities the main results and conclusions of Master's Thesis, being able to respond to a number of questions of the Jury regarding the methodology followed, the obtained results and the conclusions.
- LO3. Demonstrate a high level of autonomy when developing the Master's Thesis in such a multidisciplinary program, under the guidance of the supervisor.
- LO4. For the selected Master's Thesis topic, choose the methodologies and approaches that are mostly aligned with the future professional expectations according to the student background and preferences.

TEACHING METHODOLOGY

| General methodological aspects | |
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| The Master's Thesis is supervised by a University professor or by an experienced professional within the company where the student makes the internship. The individual work developed by the student is essential and it should cover the activities that follow. | |
| Master Thesis - Master Thesis Consultations (12 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Thesis work monitoring (4 hours): Regular meetings shall be organized with the Master's Thesis Coordinator (Coordinador de Trabajos Fin de Máster) to assess the progress made with the thesis work throughout the course. | CG5, CG6, CMT1. |
| <ul style="list-style-type: none"> ▪ Regular meetings with the supervisor to discuss progress (8 hours): The Director of the Master thesis will meet regularly with the student to provide feedback and guidance. | CG5, CG6, CMT1. |
| Master Thesis - Master Thesis Work (168 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Identification of a topic (8 hours): This involves the identification/selection of a topic that is relevant for the electric power industry, in cooperation with the thesis Coordinator and thesis Supervisor. | CG6, CG7, CMT1 |
| <ul style="list-style-type: none"> ▪ Development of project work (80 hours): Development of theoretical studies, management of available information, use of available tools, and development of tailor-made models if necessary. | CG4, CG6, CG7, CMT1. |
| <ul style="list-style-type: none"> ▪ Critical reflection on the obtained results (16 hours): the student must carefully reflect on results computed to determine whether they are in line with expectations and he fully understands these results and their implications. Possible changes to analyses may result from this reflection. | CG4, CG6, CMT1. |
| <ul style="list-style-type: none"> ▪ Drafting of the document (64 hours): the student shall write a document that is clear, and provides a faithful account of the objectives, methodologies applied, results obtained and their implications. | CG5, CG6, CG7, CMT1. |
| Master Thesis - Tutoring (up to 4 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Tutoring for groups or individual students will be organized upon request (up to 4 hours). | CG5 |
| EMIN Master Thesis Extension – Master Thesis Consultations (36 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Thesis work monitoring (4 hours): Regular meetings shall be organized with the Master Thesis Coordinator (Coordinador de Trabajos Fin de Máster) to assess the progress made with the thesis work throughout the course. | CG5, CG6, CMT1. |
| <ul style="list-style-type: none"> ▪ Regular meetings with the supervisor to discuss progress (32 hours): The Director of the Master thesis will meet regularly with the student to provide feedback and guidance. | CG5, CG6, CMT1. |
| EMIN Master Thesis Extension – Master Thesis Work (684 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Identification of a topic (32 hours): This involves the identification/selection of a topic that is relevant for the electric power industry, in cooperation with the thesis Coordinator and thesis Supervisor. | CG6, CG7, CMT1, CMT2. |
| <ul style="list-style-type: none"> ▪ Development of project work (524 hours): Development of theoretical studies, management of available information, use of available tools, and development of tailor-made models if necessary. | CG4, CG6, CG7, CMT1, CMT2. |
| <ul style="list-style-type: none"> ▪ Critical reflection on the obtained results (64 hours): the student must carefully reflect on results computed to determine whether they are in line with | CG4, CG6, CMT1, CMT2. |

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| expectations and fully understand them and their implications. Possible changes to analyses may result from this reflection. | |
| <ul style="list-style-type: none"> ▪ Drafting of the document (64 hours): the student shall write a document that is clear, and provides a faithful account of the objectives, methodologies applied, results obtained and their implications. | CG5, CG6, CG7, CMT1, CMT2. |
| EMIN Master Thesis Extension – Tutoring (up to 4 hours) | Competences |
| <ul style="list-style-type: none"> ▪ Tutoring for groups or individual students will be organized upon request (up to 4 hours). | – |

ASSESSMENT AND GRADING CRITERIA

| Assessment activities | Grading criteria | Weight |
|-----------------------|--|--------|
| Research work | <ul style="list-style-type: none"> ▪ Quality of the work: level of accomplishment of objectives ▪ Amount of work involved (reasonable amount of time to be devoted to it) ▪ Originality: whether analyses are new or similar to previous ones ▪ Contributions: relevance of the results obtained to enrich the state of the art on the subject | 75% |
| Report | <ul style="list-style-type: none"> ▪ Clarity of the document: general structure ▪ Documentation provided, scientific format | 10% |
| Thesis defense | <ul style="list-style-type: none"> ▪ Non-verbal communication ▪ Quality and clarity of the oral-presentation ▪ Language, logical development | 15% |

GRADING AND COURSE RULES

Assessment

The student may be able to defend his work, provided it has the authorization of the thesis supervisor and the thesis coordinator, once in an academic year. This may take place in February (after the end of the first semester) or July (at the end of the academic year). In order for the thesis work to be approved, it should obtain 5 or more points. The dates of evaluation periods will be announced in the web page and directly by e-mail. The Master's Thesis will be presented and defended by the student to a Tribunal made of three members (University professors and/or professionals with accredited experience in the electric power industry).

Course rules

Class attendance is mandatory according to Article 93 of the General Regulations (Reglamento General) of Comillas Pontifical University and Article 6 of the Academic Rules (Normas Academicas) of the ICAI School of Engineering. Not complying with this requirement may have the following consequences:

- Students who fail to attend more than 15% of the lectures may be denied the right to take the final exam during the regular assessment period.
- Regarding laboratory, absence to more than 15% of the sessions can result in losing the right to take the final exam of the regular assessment period and the retake. Missed sessions must be made up for credit.

Students who commit an irregularity in any graded activity will receive a mark of zero in the activity and disciplinary procedure will follow (cf. Article 168 of the General Regulations (Reglamento General) of Comillas Pontifical University).

Timing of assessment

- Regular assessment shall take place in July.
- After this, there shall be another assessment event in January/February of the next academic year. Taking this shall require registering again for the subject.

WORK PLAN AND SCHEDULE¹

| In and out-of-class activities | Date/Periodicity | Deadline |
|---|---|----------|
| Presentation and discussion of planning and rules | Week 1 | |
| Presentation of possible topics | Week 6 (discussion 1 st set), week 15 (discussion 2 nd set) | |
| Selection of topics | | Week 18 |
| Monitoring of work progress | Sessions 3,4,5,6,7,8,9,10 | |
| Research work | From session 2 until the thesis project is defended | |
| Thesis defense | Between 1 st and 24 th of July | |

| STUDENT WORK-TIME SUMMARY | | | | |
|--|-------------------------|-----------------------|--------------------------|-------------------|
| IN-CLASS HOURS – Master Thesis | | | | |
| Regular meetings with master thesis coordinator | | | | |
| 4 | | | | |
| OUT-OF-CLASS HOURS – Master Thesis | | | | |
| Identification of topic | Development of analyses | Reflection on results | Meetings with supervisor | Document drafting |
| 8 | 80 | 16 | 8 | 64 |
| ECTS credits: | | 6 (180 hours) | | |
| IN-CLASS HOURS – EMIN Master's Thesis Extension | | | | |
| Regular meetings with master thesis coordinator | | | | |
| 4 | | | | |
| OUT-OF-CLASS HOURS – EMIN Master's Thesis Extension | | | | |
| Identification of topic | Development of analyses | Reflection on results | Meetings with supervisor | Document drafting |
| 32 | 524 | 64 | 32 | 64 |
| ECTS credits: | | 24 (720 hours) | | |

MASTER THESIS STRUCTURE

Brief description of the structure of the Master Thesis

The structure of the Master's Thesis dissertation that the students have to develop should be similar to the one indicated hereafter:

- Summary

¹ A detailed work plan of the subject can be found in the course summary sheet (see following page). Nevertheless, this schedule is tentative and may vary to accommodate the rhythm of the class.

- English (and Spanish if the doc is in English): 1 pages presenting the studied problem, a very brief summary of the approach followed, the main results, and conclusions
- Foreword (optional)
- Table of contents
- List of chapters and sections
- Chapter 1: Introduction
 - Preliminary works and motivation of this thesis. Why this problem is relevant?
 - Objectives. Keep in mind one main research question but organize it around 3-5 main objectives.
 - Structure of the report
- Chapter 2: State of the art
 - A survey of the literature (journals, conferences, book chapters) on the areas relevant to the research question.
 - Original conclusions from such review. Do not just summarize previous works. Identification of gaps to be overcome with this master's thesis.
- Chapter 3: Problem setting, description, etc.
 - Presentation of the problem
- Chapter 4: Proposed Method (model, analysis, solution, etc.)
- Chapter 5: Results
 - Provide a critic analysis of the numerical results
- Chapter 6: Conclusions
 - Summary of the problem, the main findings and the discussion. Structured according to the objectives stated in chapter 1-
- In which direction should further research go?
- References
- Annexes