

Degree	Type	Year	Semester
4313136 Modelling for Science and Engineering	OB	0	2

Contact

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Prerequisites

None

Use of languages

Principal working language: english (eng)

Objectives and Contextualisation

The objective of the Master's Thesis is to prepare students for future work, a doctoral thesis or a project in a company. The ultimate goal is to have a public presentation and defense of the written report (Master Thesis) in some topic depending on the specialization of each one of the students: Complex Systems, Data Science, Mathematical Modelling or Modelling for Engineering, under the appropriate guidance by an expert in the field.

Skills

- Analyse complex systems in different fields and determine the basic structures and parameters of their workings.
- Analyse, synthesise, organise and plan projects in the field of study.
- Apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
- Apply techniques for solving mathematical models and their real implementation problems.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Formulate, analyse and validate mathematical models of practical problems in different fields.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Isolate the main difficulty in a complex problem from other, less important issues.
- Look for new areas to open up within the field.
- Recognise the human, economic, legal and ethical dimension in professional practice.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.

Learning outcomes

1. Aggregate the solutions, integrating them all into a general model.
2. Analyse the initial problem to find the best solution, breaking the problem down into easier-to-solve sub-problems.
3. Check the validity of the model with regard to the behaviour of the real system.
4. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
5. Design mathematical models that represent the system and its behaviour.

6. Identify the parameters that determine how a system works.
7. Implement the proposed solutions reliably and efficiently.
8. In the master's dissertation, describe the steps taken and the specific methodologies used.
9. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
10. Name and describe the main problems to be addressed in the study.
11. Provide novel solutions that bring added value.
12. Recognise the human, economic, legal and ethical dimension in professional practice.
13. Solve mathematical models efficiently.
14. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.

Content

There are not theoretical contents for this module.

Methodology

-Methodology: In November each student will meet with the Master's Coordinator in order to talk about the topic of the Thesis and also about the place to do the Internship in Companies and Institutions. At that moment it will be decided if the student wishes to follow a research program (and look for a Research Center) and/or to do a more applied project in a company (and look for the appropriate company). After, the student and the Master's Coordinator will meet again and then, they will decide the topic and the advisor of the Master Thesis. Once the student has been assigned his advisor, they will meet regularly.

Concerning the report and the dissertation of the Master Thesis.

General guidelines: the report should be between 50 and 100 pages long and should contain:

- A first page with the title, author's name, director's name, date.
- Abstract
- Acknowledgements
- Contents
- List of Figures, Tables, (if necessary)
- Introduction chapter
- Other chapters.
- Conclusions
- Bibliography

We recall that any paragraph taken from the Internet or from existing books must be written between quotation marks " " and carefully referencing the source.

Each student will have between 25 and 30 minutes to focus the question, lay the objectives, explain and put the results in context, and present the conclusions.

Calendar

Two periods of reading are proposed:

- Week from the 10th to the 14th of July
- Week from the 04th to the 08th of September

Bookbinding of and delivering the Master Thesis.

The Department will provide the covers for standardized binding of the Thesis. You have to write an e-mail to coord.master.matematiques@uab.cat and ask for the covers. They will be sent to you via e-mail.

The board members shall have received a copy at least **10 days before the scheduled reading**, at least in electronic format. The student himself has to deliver the report at each one of the members of the committee.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Supervised			
Regular meetings with the supervisor	25	1	5, 9, 10, 11, 12, 14
Type: Autonomous			
Elaboration of the report	275	11	1, 2, 3, 4, 6, 7, 8, 11, 13

Evaluation

The Master's Thesis will be evaluated by a committee of three persons created especially for each presentation. The grade will be divided as follows: 30% for the written report, 20% for the oral dissertation and 50% for the work itself.

The composition of the committee is decided jointly with the Master's Coordinator. The advisor of the thesis or a member of his team, would be part of the court but should not chair it. At least one member of the board should be from UAB. Once the members have accepted to be part of the board, we will arrange the date and time of the reading, trying to adapt it to the proposed periods.

Afterwards, the filled Master's file has to be sent to the following e-mail address:

coord.master.matematiques@uab.cat. It must include:

- Title
- Director/s
- Name and e-mail of the members of the board
- Date and time of the reading
- Place of reading: the Department sets aside an adequate space for the reading of the Master's thesis. If there is any preference, please indicate it.

Finally, the Department requests the Academic Commission of the Master the approval of the committee to defend the thesis.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Contents of the work	50%	0	0	1, 2, 3, 5, 6, 7, 9, 11, 13, 14
Oral dissertation	20%	0	0	4, 8, 9, 10, 11, 12

Written report	30%	0	0	1, 4, 5, 7, 11
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Bibliography

There are no specific references.