



Course Unit: 2014005 – Model-Based Development

Year 1 Semester 2 ISCED Code: 0613 ECTS: 7,5

Type of Course Unit: Compulsory Delivery Mode: Face-to-face / Distance Learning Language of Instruction: Portuguese

COURSE COORDINATOR: name

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
187,5		45							142,5

Prerequisites (if applicable): n.a.

LEARNING OUTCOMES (knowledge, skills and competence)

On successful completion of this course unit, the student should be able to:

- 1 Debate model driven engineering concepts.
- 2 Explain the importance of models in system level development for the Internet of Things (IoT).
- 3 Apply one or more formal methods in the system development for the IoT.
- 3 Characterize graphical modelling languages.
4. Construct system models using behavioural graphical languages.
5. Analyse system's behaviour based on models.
6. Apply tools for code generation from models..
7. Develop systems from graphical specifications.
8. Summarize as an article the developed work for the implementation of an IoT system.

CONTENTS

- 1 Modeling in engineering and model driven engineering;
- 2 Modularity and information hiding;
- 3 Overview of formal methods in engineering, UML, SysML, OPM, models and meta-models;
- 4 Model driven architecture (MDA), platform independent models (PIM) and platform specific models (PSM);
- 5 Model transformation and code generation;
- 6 Coloured and low-level Petri nets;
- 7 Controller specification using models;
- 8 Model based simulation and verification;
- 9 Automatic code generation from models.

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

We specify the relevant contents for each learning outcome:

- 1 Debate model driven engineering concepts (all contents).

- 2 Explain the importance of models in system level development for the Internet of Things (IoT) (all contents).
- 3 Apply one or more formal methods in the system development for the IoT (5, 6, 7, 8, and 9).
- 3 Characterize graphical modelling languages (1, 2, and 3).
4. Construct system models using behavioural graphical languages (3, 6, 7, and 9).
5. Analyse system's behaviour based on models (6, 7, and 8).
6. Apply tools for code generation from models (9).
7. Develop systems from graphical specifications (2, 3, 6, and 7).
8. Summarize as an article the developed work for the implementation of an IoT system (all contents).

TEACHING METHODOLOGIES

Each theme is started by an in class presentation and discussion about the respective contents. Each student will present an article and/or tool or language that will be debated in class with the teacher acting as moderator. In the second part of the curricular unit, students will develop a project for IoT starting from models and including an automatic code generation component .

Each project must be completed by groups of 2 or 3 students. The final grade is dependent on students performance in a final defense. An unsatisfactory performance may imply a final fail grade independently of the project quality. Each student must read and present an article from a list given at the start of the semester.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

The student should know the main concepts of model driven development and apply models to build an IoT system. As a way to guarantee the contact with a variety of concepts, tools, and languages, the expositive periods will be intercalated with interrogative methods, followed by individual reading and group in class discussion about articles introducing several themes.

After, each student will present an article, followed by discussion where all the other students participate. In the practical part, students apply the studied tools and languages to develop a final project where models are used to implement an IoT project.

EVALUATION METHODS

The assessment will have three components:

1. Final project with report and respective defense;
2. Article presentations and discussion;
3. In class discussions participation about the presented articles.

MAIN BIBLIOGRAPHY

Alberto Rodrigues da Silva, Model-driven engineering: A survey supported by the unified conceptual model, Computer Languages, Systems & Structures, Volume 43, October 2015, Pages 139-155, ISSN 1477-8424, <http://dx.doi.org/10.1016/j.cl.2015.06.001>.

Marco Brambilla, Jordi Cabot, and Manuel Wimmer. 2012. Model-Driven Software Engineering in Practice (1st ed.). Morgan & Claypool Publishers.

Dragan Gasevic, Dragan Djuric, and Vladan Devedzic. 2009. Model Driven Engineering and Ontology Development (2nd ed.). Springer Publishing Company, Incorporated.

Dov Dori, "Model-Based Systems Engineering with OPM and SysML", Springer, 2016.

K. Jensen, L.M. Kristensen, Coloured Petri Nets, Springer-Verlag Berlin Heidelberg 2009.

IOPT Tools, available at <http://gres.uninova.pt/IOPT-Tools/>, access on 2016/09/11.