



COURSE DESCRIPTION

1. Program Information

1.1 University	“Alexandru Ioan Cuza”, Iasi
1.2 Faculty	Computer Science
1.3 Department	Computer Science
1.4 Field of Study	Computer Science
1.5 Type of Degree	Bachelor
1.6 Study Program / Qualification	Licentiate in computer science

2. Course Information

2.1 Course Title	Probabilistic Programming and Modelling						
2.2 Course Coordinator	Prof.dr. Dorel Lucanu						
2.3 Seminary Coordinator	Prof.dr. Dorel Lucanu						
2.4 Study Year	3	2.5 Semester	1	2.6 Evaluation	Mixed	2.7 Course Status*	O

3. Total estimated hours (hours per semester and didactic activities)

3.1 Hours per week	4	in which: 3.2 course	2	3.3 seminar	2
3.4 Hours in curriculum	56	in which: 3.5 course	28	3.6 seminar	28
Time Distribution					hours
Individual of study using course support, bibliography, and others					14
Individual documentation in library, using electronic tools, field work					14
Preparation of seminars/laboratories, homeworks, reports, portfolios, and essays					28
Tutoring					-
Evaluation					4
Other activities					-

3.7 Total hours individual study	56
3.8 Total hours per semester	116
3.9 Number of credits	5

4. Preconditions (if necessary)

4.1 Curriculum	Object-oriented programming, Probabilities and Statistics
4.2 Competences	basic programming skills, definitions of the main probabilistic distributions

5. Conditions (if necessary)

5.1 For Course Operation	-
5.2 For Seminary/Laboratory Operation	Participation is compulsory.



6. Specific Skills Acquired

Professional Skills	C1. The ability to design probabilistic models for many applications C2. The ability to express the models you have in your head or on paper and make them operational, enabling you to evaluate and analyze different possibilities C3. The ability develop richer, more detailed, and potentially more accurate models C4. The ability to reason under uncertainty and to integrate its model into your application
Transversal Skills	CT1. The ability to reason under uncertainty in various problem domains

7. Course Objectives (from the grid of specific skills acquired)

7.1 General Objectives	Capability to use a probabilistic programming language to model and analyse real-word problems.
7.2 Specific Objectives	On successful completion of this course, students will be able to: understand, explain, analyze, use, probabilistic models in Figaro, the inference algorithms implemented in Figaro.

8. General Description

8.1	Course	Teaching Methods	Observations (hours and bibliographic references)
1.	Probabilistic programming in a nutshell	Lecture	Chapter 1 of the [PPP] book.
2.	A quick Figaro tutorial	Lecture	Chapter 2 of the [PPP] book.
3.	Creating a probabilistic programming application	Lecture	Chapter 3 of the [PPP] book.
4.	Probabilistic models and probabilistic programs	Lecture	Chapter 4 of the [PPP] book.
5.	Modeling dependencies with Bayesian and Markov networks	Lecture	Chapter 5 of the [PPP] book.
6.	Using Scala and Figaro collections to build up models	Lecture	Chapter 6 of the [PPP] book.
7.	Object-oriented probabilistic modeling	Lecture	Chapter 7 of the [PPP] book.
8.	Partial assesment		
9.	Modeling dynamic systems	Lecture	Chapter 8 of the [PPP] book.
10.	The three rules of probabilistic inference	Lecture	Chapter 9 of the [PPP] book.



11.	Factored inference algorithms	Lecture	Chapter 10 of the [PPP] book.
12.	Sampling algorithms	Lecture	Chapter 11 of the [PPP] book.
13.	Solving other inference tasks	Lecture	Chapter 12 of the [PPP] book.
14.	Dynamic reasoning and parameter learning	Lecture	Chapter 13 of the [PPP] book.

BIBLIOGRAPHY**(SELECTIONS)****MAIN REFERENCES:**

- [PPP] AVI PFEFFER. PRACTICAL PROBABILISTIC PROGRAMMING, MANNING, 2016
- FIGARO, [HTTPS://WWW.CRA.COM/WORK/CASE-STUDIES/FIGARO](https://www.cra.com/work/case-studies/figaro)

ADDITIONAL REFERENCES:

- SCALA, [HTTP://WWW.SCALA-LANG.ORG/](http://www.scala-lang.org/)

8.2	Seminary / Laboratory	Teaching/Evaluation methods	Observations (hours and bibliographic references)
1.	Installing and testing the Figaro system	Demonstrating	Figaro documentation.
2.	The first simple programs in Figaro	Demonstrating and exercises	
3.	Exercises from Chapter 2 of [PPP]	Demonstrating and exercises	
4.	Exercises from Chapter 3 of [PPP]	Demonstrating and exercises	
5.	Exercises from Chapter 4 of [PPP]	Demonstrating and exercises	
6.	Exercises from Chapter 5 of [PPP]	Demonstrating and exercises	
7.	Exercises from Chapter 6 of [PPP]	Demonstrating and exercises	
8.	Laboratory test		
9.	Exercises from Chapter 7 of [PPP]	Demonstrating and exercises	
10.	Exercises from Chapter 8 of [PPP]	Demonstrating and exercises	
11.	Exercises from Chapter 9 of [PPP]	Demonstrating and exercises	
12.	Exercises from Chapter 10 of [PPP]	Demonstrating and exercises	
13.	Exercises from Chapter 11 of [PPP]	Demonstrating and exercises	



14.	Exercises from Chapter 12, 13 of [PPP]	Demonstrating and exercises	
Bibliography the same as for the course			

9. Course content synchronization with the expectations of the community representatives, professional associations and employers from the program domain

Probabilistic programming is a new paradigm (the first article introducing this paradigm was published in 1997), which has been a rapid development in recent years, being a major research and development component of major companies like Microsoft, IBM, Amazon.

10. Evaluation

Activity Type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 The weight of each
10.4 Course	The understanding level of the taught concepts, the ability level to model and analyse Figaro models.	Written tests. Week 8: partial evaluation; Weeks 15-16: final examination.	70% = 30% + 40%
10.5 Seminary	The understanding level of the solved exercises, the ability to approach and solve unsolved exercises.	Monitoring the laboratory activity. Maximum 2 points for the active participation, and maximum 1 point bonus for exceptional activity.	30%
10.6 Minimal performance standards 20/39 points for the laboratory activity. 50/109 points from the total of points.			

Date
20.09.2017

Course Coordinator
Prof. dr. Dorel Lucanu

Seminary/Laboratory Coordinator
Prof. dr. Dorel Lucanu

Department Date of Approval

Director of the Department
Prof. dr. Dorel Lucanu