



### Course Syllabus

<b>Course Code</b> COMP-406	<b>Course Title</b> Artificial Intelligence II	<b>ECTS Credits</b> 6
<b>Prerequisites</b> COMP-405	<b>Department</b> Computer Science	<b>Semester</b> Spring
<b>Type of Course</b> Elective	<b>Field</b> Computer Science	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Lecturer(s)</b> Prof. Athena Stassopoulou	<b>Year of Study</b> 4 <sup>th</sup>
<b>Mode of Delivery</b> Face to Face	<b>Work Placement</b> N/A	<b>Corequisites</b> None

#### Course Objectives:

Critical study of theory and research related to advanced topic areas of artificial intelligence. Emphasis is given to uncertain reasoning, probabilistic networks, computer vision, image understanding, speech recognition, natural language processing.

#### Learning Outcomes:

After completion of the course students are expected to be able to:

1. explain uncertainty in knowledge representation and reasoning
2. describe various approaches for representing uncertainty and performing inference
3. construct a Bayesian network to solve a simple problem and express the probability distributions of the model
4. explain parameter and structure learning in Bayesian Networks
5. describe Dynamic Bayesian Networks and their use in temporal reasoning
6. describe the main processing components of a Computer Vision system
7. explain basic image processing and image understanding approaches
8. describe a Hidden Markov Model for speech recognition
9. describe the various language models
10. build a Naive Bayes classifier for text classification

**Course Content:**

1. Uncertain knowledge and reasoning:
  - Bayesian Networks, Dempster-Shafer Theory of Evidence, Fuzzy Logic.
  - Introduction to Bayesian Networks
  - Bayesian Updating (Bayes rule, inference, independence assumptions)
  - Propagation in Polytrees
  - Learning Bayesian Networks
  - Probabilistic reasoning over time: Dynamic Bayesian Networks
2. Computer Vision:
  - Image Processing
  - Extracting 3D-information. (Motion, binocular stereopsis, texture, shading)
  - Object Representation and Recognition
3. Speech Recognition: Speech Recognition model, Hidden Markov Models.
4. Natural Language Processing: Basic text processing, Language modelling, text classification

**Learning Activities and Teaching Methods:**

Lectures, Practical Exercises and Assignments

**Assessment Methods:**

Mid-term exam, Projects, Assignments, Final Exam.

**Required Textbooks / Readings:**

Title	Author(s)	Publisher	Year	ISBN
Artificial Intelligence: A Modern Approach (3 <sup>rd</sup> ed)	S. Russell and P. Norvig	Prentice Hall	2010	0132071487

**Recommended Textbooks/Reading:**

<b>Title</b>	<b>Author(s)</b>	<b>Publisher</b>	<b>Year</b>	<b>ISBN</b>
Probabilistic Graphical Models: Principles and Techniques	D. Koller and N. Friedman	MIT Press	2009	0262013193
Machine Vision	R. Jain, R. Kasturi and B.G. Schunk	Prentice Hall	1995	0070320187
Foundations of Statistical Natural Language Processing	C. D. Manning, H. Schutze	MIT Press	1999	0262133601