COURSE OUTLINE

GENERAL

SCHOOL	Sciences and Engineering		
ACADEMIC UNIT	Computer Science		
LEVEL OF STUDIES	1st Cycle		
COURSE CODE	COMP-342	**SEMESTER**	Fall
COURSE TITLE	Data Visualization		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	2.5	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	special background
PREREQUISITE COURSES:	COMP-140
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

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

- Develop an understanding of the fundamentals of storytelling through data and the alignment around basic concepts that are required to effectively present and communicate analysis results.
- Distinguish between informative and deceitful data visualizations.
- Create relatively high-quality visualizations to aid statistical and exploratory data analysis by applying suitable visualization techniques and aesthetic principles.
- Apply appropriate principles to depict data distributions, uncertainty and error bounds to extract and explore hidden relationships and correlations among visualized data.

- Leverage incremental and approximation techniques like aggregations and filtering to balance the complexity and clutter when visualizing large datasets and data streams.
- Demonstrate the ability to curate and visually depict spatio-temporal datasets.
- Acknowledge the basic methods and principles for creating informative, interactive and responsive data visualization dashboards and services.
- Develop a level of competency on the use of software tools for data visualization.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Production of free, creative and inductive thinking

SYLLABUS

1.Storytelling Through Data
   a. The Art of Visual communication
   b. Components of storytelling
   c. The storytelling with data process
   d. Exploratory vs Explanatory visualizations
2.Aesthetics
   a. Coordinate Systems and Axes
   b. Data Types, Color Coding and Scales
   c. Visualizing Univariate Data
   d. Bar and Pie charts, Scatter Plots, Heatmaps
3.Data Distributions and correlations
   a. Histograms
   b. Density Plots
   c. Correlograms
   d. Data Correlation vs Causality
4.Data Quality and Uncertainty
   a. The Data Quality Continuum
   b. Uncertainty in Empirical Data

c. Measuring Data Quality
d. Error-Bounds, Box Plots and Quantile-Quantile (Q-Q) Plots

5.Timeseries, Text and Spatio-Temporal Data
a. Point and Distance Data
b. Timestamped Data
c. Plotting Maps, Graphs and Word Clouds
d. Geographic Information Systems

6.Data visualization at scale
a. Data Reduction and aggregation
b. Scalable visualization tools
c. Drilldown and Filtering Capabilities

7.Dashboards and Services
a. Data and Service Integration
b. Creation of dashboard and reports
c. Performance and Scalability
d. Customization and Personalization

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching / Χρήση ΤΠΕ* *Communication with students / Επικοινωνία με Φοιτητές*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Homework Assignments, Midterm Exam, Collaborative Team Project, Participation, Final Exam

Activity	***Semester workload***
Lectures	35
Preparation	26
Coursework	40
Exam Preparation	45
Examination	4
Course total	***150***

ATTACHED BIBLIOGRAPHY

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Visualization Analysis and Design	Tamara Munzer	CRC Press	2014	978-1-466-50891-0

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Fundamentals of Data Visualization	Claus O. Wilke	O'Reilly Media	2019	978-1-492-03108-6
Python Data Science Handbook	Jake VanderPlas	O'Reilly Media	2016	978-1-491-91205-8
The Visual Display of Quantitative Information (2nd edition)	Edward Tufte Graphics	Graphics Press	2001	978-1-930-82413-3