Institution: **Università Ca' Foscari Venezia**

Specialization: **"Web Interfaces and Web Software Technologies" (*Interfacce Web e Tecnologie Software per il Web)***

Aim of the specialization: This specialization aims to cover many aspects of Web software development, and includes several courses that cover different aspects of Web programming and software development. In particular, Web technologies, Web interfaces, and software engineering principles. Students learn to work in project groups. Each courses are taught in one of the two semesters. Each ECTS credit corresponds to 7 hours of lessons.

Courses

Core courses of the 3rd year of specialization	
Course title	**ECTS Credits**
Human-Computer Interaction	6
Web design	6
Software Engineering	6
Web Applications and Technologies	6
Stage / Project (in preparation for the final exam)	12
Final Dissertation/Exam	6
Total	**42**

Elective courses to complete the 60 ECTS-Credits of the 3rd year	
Course title	**ECTS Credits**
Laboratory of System Administration	6
Probability and Statistics	6
Internet Languages: XML	6
Formal Languages and Computability	9
Algorithms and Data Structures - mod. I	9
Algorithms and Data Structures - mod. II	6
Law for Computer Science	6
Italian Language	6

Syllabi of the Courses

Human-Computer Interaction

Objectives

The course illustrates the fundamentals of the interaction between humans and computers.

Contents

Foundations

- The human
- The computer
- The interaction

Interaction Paradigms

- Batch and time sharing
- Window systems, WIMP
- Direct manipulation
- Textual and visual languages
- Hypertext
- Multimodality
- Pervasive computing
- Sensor and context based paradigms
- Virtual and augmented reality
- Interactive 3d worlds

Design

- Design rules
- Evaluation techniques
- Universal design

Designing an interface

Textbooks

A. Dix, J. Finlay, G. D. Abowd, R. Beale. *Human-Computer Interaction (Third Edition)*. Prentice Hall, 2003

Exam: Written exam + complementary task.

6 ECTS	4 hours/week	one semester

Web Design

Objectives

Basics of web design for creating and analyzing web sites. Techniques for designing web sites accessible from visual browsers for normal and small screens, printers and auditory browsers.

Contents

- Web Design vs. Graphics Design. Managing Colours. Using Fonts. Managing the Layout.
- Planning a Web Site. Defining the User Requirements. Organizing Information. Designing Navigation Systems.
- Usability Heuristics for the Web.
- Accessibility. Understanding Accessibility. The W3C Accessibility Guidelines. The Stanca Act.
- The XHTML Language. Structural XHTML Tags. Formatting Text. Links and Navigation. Adding Images. Tables.
- Cascading Style Sheets. Syntax Rules. Adding Styles to an XHTML Document. Inheritance. Type-Related, Box and Background Properties.

Textbooks

L. Rosenfeld, P. Morville. *Information Architecture for the World Wide Web (Third Edition)*, O'Reilly, 2006.
J. Zeldman, *Designing with Web Standards (Third Edition)*, Peachpit Press, 2009.

Exam: Project + written exam.

6 ECTS	4 hours/week	one semester

Software Engineering

Objectives
To acquire the main methodologies for the planning and management of a large software project.

Contents
- Software Processes and Project Management
- Requirement Engineering Processes - System Models - Prototyping
- Design Methodologies - UML
- Verification and Validation Techniques
- Managing People - Software Cost Estimation - Software Change
- Legal and Quality issues
- Laboratory Activities: Project Work in Team
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Textbooks
Ian Sommerville. *Software Engineering. 7th ed.*, Addison Wesley, 2004
Roger S Pressman, *Software Engineering: A Practitioner's Approach*, McGraw-Hill, 6th ed., 2005
R.T.Furtrell, D.F.Shafer, L.I.Shafer: *Quality Software Project Management*, Prentice Hall PTR, 2002
Sinan Si Alhir: *Learning UML*, O'Reilly, 2003

Exam: Project discussion.

6 ECTS	4 hours/week	one semester

Web Applications and Technologies

Objectives
To learn TCP/IP programming, Web network programming, fundamentals of Java Web technologies, design principles of client/server applications.

Contents
- Client/server paradigm, and server implementations
- HTTP protocol, HTML language, and URL syntax
- Servlets, JSP, JDBC, JNDI, and Applet
- Javascript, and AJAX
- Application examples with Java Web-based technology
- The Model-View-Controller Pattern

Textbooks
D. Comer, D. Stevens. *Internetworking with TCP/IP*. Volume III. Pretice-Hall, 1993.
Online resources and lecture notes.

Exam: Project discussion.

6 ECTS	4 hours/week	one semester

Laboratory of System Administration

Objectives
To learn principles of system and network administration.

Contents
- Regulations and good practice for system administrators.
- Network Operating Systems. The services: telnet, directory X.500 e LDAP, e-mail, printing, file sharing, file transfer, web, intranet, extranet, scripting, DNS, DHCP, domains.
- Microsoft Operating Systems: basic tools for administrators, managements of users, basic services: FTP, telnet, http - IIS. Console commands and scripts.
- Linux Operating Systems: installation and configuration. Main network services. RPM Package Manager. Boot loader personalization. Environment variables. Different user interfaces for the administrator. User administration, and file system management. Configuration of the main daemons: Apache, FTP and Telnet. Scripting languages.

- Advanced management procedures: backup, resource monitoring, Syslog and Win Performance, Network performance analysis, Network monitors/sniffers.
- Utilities for system/network monitoring and management: ping, traceroot, pathping, ifconfig, netstat, netconfig, lsof.
- Policies for Network and System Security: firewalling, etc.

Textbooks
Lectute notes.
"Cisco IT Essentials II: Network Operating Systems v 3.0".

Exam: Written exam.

6 ECTS	4 hours/week	one semester

Probability and Statistics

Objectives
This is an introductory course to Probability and Statistics. It aims at providing the fundamental tools to model and deal with problems in the presence of uncertainty.

Contents
- Calculus of probability: Assiomatic definition of probability, Conditional probability and independence
- Random Variables: (Cumulative) Density functions, Expected value and variance, Vectors and joint distributions
- Convergence of random variables: Central Limit Theorem, Law of Large Numbers
- Parametric inference
- Linear Regression
- Hypothesis testing
- Introduction to simulation
- Randomized algorithms

Textbooks
Paolo Baldi, *Calcolo delle ProbabilitÃ e Statistica (seconda edizione)*. McGraw-Hill, ISBN 8838607370, 1998.
Ross S.M., *Calcolo delle ProbabilitÃ (seconda edizione)*. Apogeo, 2007.

Exam: Written exam.

6 ECTS	4 hours/week	one semester

Internet Languages: XML

Objectives
The architecture of the Web suffers from some big pitfalls. XML, the so-called "universal language" of the Web, has proposed a new way to handle information, so to overcome the present limits. XML claims to be a really universal, and interoperable, language, which is not only able to provide a flexible model for the growth of a second-generation Web, but also the real reference language of information exchange and processing. In this course, we shall first analyze the current Web from the viewpoint of information handling, and we shall then show the innovative points of XML, its limitations, and the family of related technologies.

Contents
- The World Wide Web: Current structure of the World Wide Web. Fundamental architectural principles
- Information in the current Web: Working models. Information handling.
- Information coding: XML as a mean for information coding.
- Information structuring: Information structuring at various levels. Information modeling in XML. Meta-levels.
- Visualization: The passage from information to the media in XML.
- Meaning: To shape meaning with XML. Common sense and the Semantic Web. Ontologies and Reasoning.
- Privacy: Web and Society. Spies in the Web. XML as solution to the privacy problems in the Web.
- The Web of the Future: vision of the foundational family of technologies for XML; integration

problems. The new technologies.

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Textbooks
Online resources.
Elliotte Rusty Harold. *XML Bible* IDG Books, ISBN 0-7645-3236-7

Exam: Written and optional oral exam.

6 ECTS	4 hours/week	one semester

Formal Languages and Computability

Objectives
In the course we study different models of calculus and some techniques to show that a problem does not admit algorithmic solutions. Moreover, we provide the basis of formal languages, grammars, and automata.

Contents
Computability Theory

- The Turing-machine model. RAM model and other equivalent models of effective computability. The Church-Turing thesis.
- Decidable and undecidable problems. Recursively-enumerable sets. The halting problem, the problem of auto-reference, and other examples of undecidable problems.
- Reducibility. Examples of many-one reductions. Rice theorems. First and second recursion theorem. Recursive Functional and the solution of the recursive equations.

Formal Languages and Automata

- Grammars and Automata: syntax and semantics, ambiguity, Chomsky classification.
- Regular grammars, regular expressions and finite automata.
- Context free grammars and pushdown automata. Deterministic languages.
- Context sensitive grammars and type 0, Turing machines and decidability problems.
- Attribute grammars.
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Textbooks
N.J. Cutland, *Computability: An introduction to recursive function theory*, Cambridge Univ. Press, Cambridge 1980.
Hopcroft J., Ullman J., *Introduction to Automata Theory, Languages and Computation*, Addison Wesley, 1979.
Hopcroft J., Motwani R., Ullman J., Automi, *Linguaggi e Calcolabilità* , Addison Wesley - Pearson, 2003.

Exam: Written exam.

9 ECTS	6 hours/week	one semester

Algorithms and Data Structures - mod. I

Objectives
The course aims at providing an introduction to the main data structures and to the fundamental techniques for the design and the analysis of algorithms.

Contents
Introduction (models of computation, asymptotic notation, recurrences). Elementary data structures. Sorting (heapsort, mergesort, quicksort, medians and order statistics). Search trees (binary, red-black, AVL). Hashing. Basic techniques for the design of algorithms (divide and conquer, dynamic programming, greedy). Graphs and graph search. Minimum spanning trees (Kruskal, Prim). Shortest paths (Dijkstra, Bellman-Ford, Floyd-Warshal). NP-complete problems.

Textbooks
T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein. *Introduction to algorithms (Second Edition)*, MIT Press, 2001.
C. Demetrescu, I. Finocchi, G. F. Italiano. *Algoritmi e strutture dati (seconda edizione)*, McGraw-Hill, 2008.

Exam: Written and oral exams.

9 ECTS	6 hours/week	one semester

Algorithms and Data Structures - mod. II

Objectives

This course extends and complements the subjects and the techniques introduced in the first module. Every topic is provided with laboratory tests that implement the theory and apply it to actual matters. The course will present the principal techniques of "problem solving" in order to develop the capability of students to formalize and solve problems with mathematical rigor and method.

Contents

Flow networks

- Maximum flow. Ford-Fulkerson method. Edmonds-Karp algorithm. Application to maximum matching in bipartite graphs. Case study: Image segmentation.

String matching

- Rabin-Karp algorithm. Sting-matching automaton. Knuth-Morris-Pratt algorithm. Case study: RNA secondary structure prediction.

Computational Geometry

- Problems of basic geometry. Convex hull. Graham and Jarvis algorithms. Pair of closest dots. Case study: Convex hull applications.

The various topics are provided with lab tests that check and apply the skills given during the course.

Textbooks

T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein. *Introduction to algorithms (Second Edition)*, MIT Press, 2001.

C. Demetrescu, I. Finocchi, G. F. Italiano. *Algoritmi e strutture dati (seconda edizione)*, McGraw-Hill, 2008.

Exam: Midterm tests. Final examination: written and oral.

6 ECTS	4 hours/week	one semester

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Contents

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Exam: Midterm tests. Final examination: written and oral.

6 ECTS	4 hours/week	one semester

Law for Computer Science

Objectives

This course is focused on the problem of the intersection between the Information Technologies (IT) and the

structure of modern Law, testing the efficiency of the Law to rule the relationships in the Net. **Contents** Technique and Law of the Internet. Internet and the crisis of domestic and international law. Rethinking the classical structure of the Law related with the Internet: economic resources and new goods; protection of privacy; protection of intellectual property; property and internet access; acts, contracts and concurrence of wills; Torts in Internet; ADR. Some specific aspects of electronic commerce (E.U. Directives and national statutes). The general problem of enforcing private law rules in internet. **Textbooks** Giovanni Pascuzzi, *Il diritto dell'era digitale*, Il Mulino, Bologna, Seconda Edizione, 2006.
Exam: Midterm tests. Final examination: written and oral.

6 ECTS	4 hours/week	one semester

Italian Language
Course offered by the Linguistic Center of the Univesity (CLA) Various levels are available: A1 - Principiante A2 - Elementare A2 - Elementare B1.1 - Pre-Intermedio 1 B1.2 - Pre-Intermedio 2 B2.1 - Intermedio 1 B2.2 - Intermedio 2 C1 - Progredito 1 It is also possible to follow a module focused on practice in written Italian.
Exam: Final test.

6 ECTS		one semester

Range of the marks

30 and “30 e lode (cum laude)” ……..…… excellent
27 – 29 ……. very good
24 – 26 ..... ……..……good
21 – 23 ..... ……..…… satisfactory
18 – 20 ..... …… sufficient
0 – 17……... ……not passed