SYLLABUS
COURSE DESCRIPTION

COURSE TITLE	**Formal Languages and Compilers**
COURSE CODE	76214
SCIENTIFIC SECTOR	INF/01
DEGREE	Bachelor in Computer Science
SEMESTER	2nd
YEAR	2nd
CREDITS	6

TOTAL LECTURING HOURS	40
TOTAL LAB HOURS	20
PREREQUISITES	Knowledge of both Java and C programming languages, and working in Linux environment
COURSE PAGE	https://ole.unibz.it/ and http://www.inf.unibz.it/~artale/Compiler/compiler.htm

SPECIFIC EDUCATIONAL OBJECTIVES	Type of course: "caratterizzante" Scientific area: "Discipline informatiche" The main objective is to introduce the fundamental notions about formal languages (Chomsky classification of Languages, Regular Languages, Automata, Context Free Grammars) and understand the mechanisms governing the analysis and synthesis of programming languages. Students will learn the most important techniques for the representation and generation of Languages (in particular, regular and context-free languages). Those techniques will be applied to the construction of a compiler for a programming language. In particular, during this course the student will learn how to build the different parts of a Compiler with a particular emphasis on Lexical Analysers, Parsers and a basic form of code generation.

LECTURER	Alessandro Artale
SCIENTIFIC SECTOR OF THE LECTURER	INF/01
TEACHING LANGUAGE	English

OFFICE HOURS	During the lecture time span, Office 2.03. To fix an appointment email at artale@inf.unibz.it
TEACHING ASSISTANT	Alessandro Artale
OFFICE HOURS	-
LIST OF TOPICS COVERED	• Formal language theory • Regular languages: automata, regular expressions, regular grammars • Context free languages (stack machines) • Lexical and syntactic analysis: Lexer specification, top-down and bottom-up parsing • Symbol tables, semantic analysis • Principles of code generation
TEACHING FORMAT	Frontal lectures, labs with (programming) exercises, team projects.

LEARNING OUTCOMES	**Knowledge and understanding** • knowing the concepts of formal languages, the techniques of compilation and various programming paradigms. **Applying knowledge and understanding** • being able to develop and construct translators and compilers. **Ability to make judgments** • being able to work autonomously according to the own level of knowledge; • being able to take the responsibility for software development projects. **Communication skills** • being able to work in teams to implement software systems; • being able to use modern communication systems. **Ability to learn** • have developed learning capabilities to pursue further studies with a high degree of autonomy; • have acquired learning capabilities that enable them to carry out project activities in companies, public institutions or in distributed development communities.

ASSESSMENT	Project conducted in team and a written exam. In the project part of the exam we will assess the learning outcomes related to the application of the acquired knowledge, the ability to make judgments and the communication skills. In fact, the goal of the project is to design a compiler for a small programming language. The project part must be positively evaluated before the written exam. In the written exam there will be verification questions, transfer of knowledge questions and exercises. The learning outcome related to knowledge and understanding, applying knowledge and understanding and those related to the student ability to learn and the acquired learning skills will be assessed by the written exam.

Fakultät für Informatik
Facoltà di Scienze e Tecnologie informatiche
Faculty of Computer Science

ASSESSMENT LANGUAGE	English
EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS	• Project: Compiler Development (30%) • Final Written Exam (70%) Written exam questions will be evaluated in term of correctness and clarity. Project is evaluated in term of quality of the solution: complexity and novelty of the programming language to be compiled, data structures used in implementing the symbol table, depth of the semantic analysis carried on. The project will count for 3 regular consecutive exam sessions.

REQUIRED READINGS	Compilers: Principles, Techniques, and Tools (2nd edition). Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeff Ullman. Publisher: Addison Wesley, 2007. Introduction to Automata Theory, Languages, and Computation (3rd edition). J.E. Hopcroft, R. Motwani, J.D. Ullman. Addison Wesley, 2007.
SUPPLEMENTARY READINGS	Compiler Construction: Principles and Practice, Kenneth C. Louden. Publisher: Brooks Cole, 1997. Advanced Compiler Design and Implementation, Steven Muchnick. Publisher: Morgan Kaufmann, 1997. Programming Language Processors in Java: Compilers and Interpreters, David Watt and Deryck Brown. Publisher: Prentice Hall, 2000.
SOFTWARE USED	C or Java, YACC, LEX, Linux OS