COURSE DATA

Data Subject	
Code	34671
Name	Automata, formal languages and applications
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	School of Engineering	2	Second term

Subject-matter

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	11 - Computing and programming	Obligatory

Coordination

Name	Department
DIAZ FERNANDEZ, MARIA ELENA	240 - Computer Science
FERRI RABASA, FRANCESC JOSEP	240 - Computer Science
MARTINEZ GIL, FRANCISCO	240 - Computer Science

SUMMARY

Introduction to computing fundamentals from symbol processing and formal languages to computation models and solvability issues

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

none

OUTCOMES

1400 - Degree in Computer Engineering

- G8 - Knowledge of basic subject areas and technologies that serve as a basis for learning and developing new methods and technologies, and of those which provide versatility to adapt to new situations.
- G9 - Ability to solve problems with initiative, decision making, autonomy and creativity. Ability to communicate and transmit the knowledge, skills and abilities of a computer engineer.
- R6 - Knowledge and application of basic algorithmic procedures of computer technology to design solutions to problems, by analysing the suitability and complexity of the algorithms proposed.
- TI2 - Ability to select, design, implement, integrate, evaluate, build, manage, exploit and maintain hardware, software and network technologies, within adequate cost and quality thresholds.
- C2 - Ability to acquire, obtain, formalise and represent human knowledge in a computable form for solving problems through a computer system in any field, particularly in those related to aspects of computing, perception and action in intelligent environments.

LEARNING OUTCOMES

Reason with models of calculation of finite states and extrapolate these to practical situations in programming and design of devices. (G-8, G-9, R-6, TI-2, C-2)

Handle regular expressions and use tools associated to filter information with different objective. (G-8, G-9, TI-2, C-2)

Optimize (minimize) models of finite states for particular applications. (G-8, G-9, C-2)

Resolve simple problems posed on chains of symbols reasoning recursively by means of stack-based models. (G-8, G-9, R-6, TI-2, C-2)

Know and apply the basic concepts of syntactic lexical/analysis using tools for the building of analysers. (G-8, G-9, R-6, C-2)

Express concepts associated to languages and computation in a rigorous way and without ambiguity. (G-8, G-9, R-6, TI-2, C-2)

Know the limits of computation and the classical undecidable problems associated to models of computation. (G-8, G-9, R-6, TI-2)

Know and handle Turing's machines and other models of computation and study his behavior using simulators or software associated. (G-8, G-9, R-6, TI-2, C-2)

Relate some problems with others by means of reduction and polynomial reduction. (G-8, G-9)

Know some classical problems NP-complete and the main variants. (G-8, G-9, R-6, TI-2, C-2)

Know some algorithmic solutions to some NP-complete interesting problems. (G-8, G-9, R-6, TI-2, C-2)

DESCRIPTION OF CONTENTS

1. Finite automata and regular expressions

Symbols, strings, finite automata and regular expressions

2. Grammars and push-down automata

Chomsky hierarchy, context-free grammars and push-down automata.

3. Grammars and parsing

Specific grammars, processing and parsing algorithms

4. Computability

Turing machines, computational models, unsolvable problems and reducibility.

5. Complexity and tractability

Asymptotic costs, polynomic reducibility, NP-completeness.

6. Algorithmic solutions

Different versions of NP-complete problems. Efficient and practical solutions.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	5,00	0
Development of individual work	10,00	0
Study and independent work	25,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	5,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

- theory and problem teaching with student participation. (G-8,G-9,R-6,TI-2,C-2)
- discussion sessions and problem solving. (G-8,G-9,R-6,TI-2,C-2)
- lab sessions. (G-8,G-9,R-6,TI-2,C-2)
- quiz solving both in class and remotely. (G-8,G-9,R-6,TI-2,C-2)
- monograph writing and bibliographic search both individually and groupwise. (G-8,G-9,R-6,TI-2,C-2)

EVALUATION

Weighted average of the following items (weights for the 2nd round in brackets):

Attendance and participation: 10% (5%) (it cannot be retaken) (G-8,G-9,R-6,TI-2,C-2)
Partial tests: 15% (7.5%) (not compulsory, it cannot be retaken) (G-8,G-9,R-6,TI-2,C-2)
Labs: 25% (12.5%) (compulsory, it cannot be retaken) (G-8,G-9,R-6,TI-2,C-2)
Final test: 50% (75%) (compulsory) (G-8,G-9,R-6,TI-2,C-2)

In case the partial tests are not done, their weights are added to the weight of the final test.

The individual marks must be superior or equal to 5 (out of 10) in order to compute the final mark.

During the tests it is forbidden the use of electronic devices or documents and mobile telephones.

In any case, the evaluation of this subject will be done in compliance with the University Regulations in this regard, approved by the Governing Council on 30th May 2017 (ACGUV 108/2017)

REFERENCES

Basic

- J. Hopcroft, R. Motwani, J. Ullman. Introducción a la teoría de autómatas, lenguajes y computación. 2a ed. Addison-Wesley, 2005
- E. Alfonseca Cubero, M. Alfonseca Moreno, R. Moriyón Salomón. Teoría de autómatas y lenguajes formales. McGraw-Hill/Interamericana de España, D.L., 2007
- F. Ferri, Teoria d'autòmats i llenguatges formals. Universidad de Valencia. Servicio de Publicaciones, 2004

Additional

- D. Kelley. Teoría de Automátas y Lenguajes formales. Prentice-Hall, Madrid, 1995
- K.C. Louden, Construcción de compiladores: Principios y Práctica. Paraninfo, 2004
- P. Isasi, P. Martínez, D. Borrajo. Teoría de lenguajes, gramáticas y autómatas. Adisson-Wesley, 2001