Course guide
330216 - FMT - Fundamental Mathematics for Icts

Last modified: 05/07/2023

Unit in charge:	Manresa School of Engineering
Teaching unit:	749 - MAT - Department of Mathematics.

Degree:	BACHELOR'S DEGREE IN ICT SYSTEMS ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer:	JOSE MIGUEL GIMENEZ PRADALES
Others:	ENRIC VENTURA CAPELL

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Capacity for the resolution of the mathematical problems that the student will have in the enginyeria. Ability to apply the coneixements on: conjunct theory, combinatorics, Boolean algebra, logic, graphs, direct graphs, enter names, integer divisibility, differential calculation, optimization.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
3. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

Know and apply techniques and methods of discrete mathematics

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours small group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. SET THEORY

Description:
First definitions and properties of Set Theory.
Principle of inclusion-exclusion. Binary relations.
Equivalence relations. Partitions.
Relations of order. Hasse diagram.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

2. COMBINATORICS

Description:
Basic counting techniques. Groupings of elements with and without repetition.
Applications. Combinatorial numbers. Newton's binomial.
Permutations. Symmetrical group.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

3. BOOLEAN ALGEBRAS AND LOGIC

Description:
Operations in a Boolean algebra. Duality.
Boolean functions. Minterms and maxterms. Canonical forms.
Simplification methods of Boolean functions.
Introduction to Logic. Algebra of propositions: tautology and contradiction.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

4. GRAPH THEORY

Description:
Graphs and digraphs: first definitions and properties.
Matrix representation of graphs and digraphs. Applications.
Exploration of graphs and digraphs: paths, cycles, planarity, flow.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

5. ARITHMETIC

Description:
Whole division. Prime numbers. Factorization of an integer. Greatest common divisor.
Solving equations with integer unknowns.
Congruent numbers. Congruence resolution.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

6. SCALAR FIELDS

Description:
Conics and quadrics.
Representation of scalar fields and contour lines.
Partial derivatives. Gradient vector. Directional derivatives. Extremes.

Full-or-part-time: 25h
Theory classes: 5h
Laboratory classes: 5h
Self study : 15h

ACTIVITIES

E1: Written exam

Full-or-part-time: 10h
Theory classes: 2h
Self study: 8h

E2: Written exam

Full-or-part-time: 10h
Theory classes: 2h
Self study: 8h

E3: Written exam

Full-or-part-time: 12h 30m
Theory classes: 2h 30m
Self study: 10h

GRADING SYSTEM

BIBLIOGRAPHY

Basic:

- García Merayo, Félix. Matemática discreta. 3a ed. Madrid: Paraninfo, 2015. ISBN 9788428335683.
- Biggs, Normam L. Discrete mathematics. 2nd ed. Oxford: Oxford University Press, 2002.
- Comellas, F. et al. Matemática discreta [on line]. Barcelona: Edicions UPC, 2001 [Consultation: 17/12/2020]. Available on: http://hdl.handle.net/2099.3/36194. ISBN 8483014564.
- Larson, R. E.; Hostetler, R. P.; Edwards, B. H. Cálculo y geometría analítica. 6ª ed. Madrid: McGraw-Hill, 1999. ISBN 8448123549.
- Permingeat, N.; Glaude, D. Álgebra de Boole. Barcelona: Vicens Vives, 1993. ISBN 8431632941.

Complementary:

- Giménez Pradales, J. M. Álgebra de Boole para ingeniería técnica. Manresa: EUPM. Deptament de Matemàtica Aplicada 3, 2004. ISBN 8493345105.