Data Processing

Academic Year: (2024 / 2025) **Review date: 08-05-2024**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: MOLINA BULLA, HAROLD YESID

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

OBJECTIVES

Core Competencies
CB6 Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context.
CB7 That students know how to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
CB8 Students should be able to integrate knowledge and face the complexity of making judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
CB9 That students know how to communicate their conclusions and the ultimate knowledge and reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way.
CB10 That students possess the learning skills that will enable them to continue studying in a way that will be largely self-directed or autonomous.

General competencies

CG3 Proactive ability to approach and solve problems under new or unfamiliar environments, within the context of IoT.
CG4 Ability to work in a team, integrating multidisciplinary approaches.
CG5 Capacity for public communication of concepts, developments and results, related to IoT activities, adapted to the profile of the audience.
CG6 Ability to apply acquired knowledge and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts, with the ability to integrate knowledge.
GC7 Ability to know how to communicate (orally and in writing) the conclusions - and the knowledge and ultimate reasons that support them - to specialized and non-specialized audiences in a clear and unambiguous way.
CG8 Capacity for continuous, self-directed and autonomous learning.

Specific competences
SC7 Ability to apply the different methods of treatment and massive support of dynamic data in energy facilities.
SC8 Ability to design, plan and control industrial applications using IoT technologies.
SC9 Programming and simulation skills of sensing and control systems at various levels (high-intermediate-low): OpenCV, ROS, Gazebo, etc.
CE10 Ability to integrate different sensing and process control systems from both hardware and software point of view.

LEARNING OUTCOMES
The learning outcomes that students should have are:
- To know the basic elements about computer vision applied to IoT.
- Ability to analyze, design and program applications based on computer vision.
- Knowledge of IoT tools for energy efficiency in buildings and smart homes.

- Ability to design printed circuit boards to implement a digital electronic system.
- Ability to understand the thermal implications of the power consumption of the system components and its implication for the package design.
- Ability to design the power system required to provide the voltages and currents needed by different integrated electronic systems.
- Ability to solve regression, classification and, in general, data analysis problems.
- Knowledge and application of systems for processing large amounts of data generated in real time through IoT devices.
- Ability to design data processing solutions in IoT environments.

DESCRIPTION OF CONTENTS: PROGRAMME

3. Data processing
a. Supervised learning techniques for data transmission
b. Unsupervised learning techniques for data transmission.
c. Batch data processing (hadoop/spark), and
d. Stream data processing (spark/storm/flink).
e. Management of large volumes of data, differentiation between batch and stream processing.
f. Balancing architectures in varnish, kafka backends
g. Scalable storage architectures cassandra / Hbase

LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES OF THE SYLLABUS REFERRED TO SUBJECTS
AF1 Theoretical class
AF4 Laboratory practice
AF6 Group work
AF7 Individual student work
AF8 Partial and final exams

Code
Activity No. Total hours No. Classroom hours % Classroom attendance Student
AF1 52 52 100
AF4 32 32 100
AF6 80 0 0
AF7 128 0 0
AF8 8 8 100
TOTAL SUBJECT 300 92 31% 31

FORMATIVE TEACHING METHODOLOGIES OF THE
PLAN REFERRED TO SUBJECTS
MD1 Class lectures by the professor with the support of computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.
MD2 Critical reading of texts recommended by the professor of the subject: press articles, reports, manuals and/or academic articles, either for later discussion in class, or to expand and consolidate the knowledge of the subject.
MD3 Resolution of practical cases, problems, etc., posed by the teacher individually or in groups.
MD4 Presentation and discussion in class, under the moderation of the professor of topics related to the content of the subject, as well as case studies.
MD5 Elaboration of works and reports individually or in groups.
MD6 Internships in collaborating companies and laboratories of recognized prestige.

ASSESSMENT SYSTEM

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

Group laboratory works: 100%
Session Laboratory Reports: 40%
Special Practical Works (2): 60% (2x30%)

BASIC BIBLIOGRAPHY

- George, Lars HBase: The Definitive Guide, O'Reilly.

- H. Karau, A. Konwinski, P. Wendell, and M. Zaharia, Learning Spark¿: Lightning-Fast Big Data Analysis, O'Reilly, 2015

- Sandy Ryza Advanced analytics with spark¿: patterns for learning from data at scale, O'Reilly, 2015

ADDITIONAL BIBLIOGRAPHY

- PENTREATH, N. y PAUNIKAR, A Machine learning with Spark : create scalable machine learning applications to power a modern data-driven business using Spark, Packt Publishing, 2015

BASIC ELECTRONIC RESOURCES

- Apache Foundation . SPARK: https://spark.apache.org

- Apache Foundation . HBase: http://hbase.apache.org

- Apache Foundation . Hadoop: http://hadoop.apache.org