Big Data for Space Missions

Academic Year: (2019 / 2020) **Review date: 07-06-2019**

Department assigned to the subject: Department of Signal and Communications Theory

Coordinating teacher: MOLINA BULLA, HAROLD YESID

Type: Electives ECTS Credits : 3.0

Year : 2 Semester : 1

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

Basic competences

CB6 To 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 Students must know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study
CB8 Students must be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments
CB9 Students must know how to communicate their conclusions and the knowledge and ultimate reasons that sustain them to specialized and non-specialized audiences in a clear and unambiguous way
CB10 Students must have the learning skills allowing them to continue studying in a way that will be largely self-directed or autonomous.

General competences

CG1 Capacity for the formulation, critical verification and defense of hypotheses, as well as the design of experimental tests for verification.
CG5 Ability to handle the English, technical and colloquial language.

Specific competences

CE15 Ability to develop a professional activity in an organization, being aware of the business and enterprise context.

DESCRIPTION OF CONTENTS: PROGRAMME

Common topics:

It is considered relevant for the present program that students can shape part of their space engineering curriculum according to their interests and motivations, in a personalized way. To this end, this subject includes mainly a set of optional subjects. The optionality also has a double benefit: it allows first to monitor the topics of greater demand and interest on the part of the students and secondly to adapt every few years the offer of courses to the new trends in space engineering.

Given that the number of elective courses is equivalent to 5 of 3 ECTS each, the offer of the master will be equivalent to 10 courses of 3 ECTS. A minimum number of students enrolled is required for the courses to take place. This number cannot be, in any case, higher than 50% of students enrolled in the master.

In-company internships are offered within this subject, optionally. In the same way, students will be able to participate in supervised development projects, in which they would work in a practical and specialized way some of the aspects dealt with in the previous subjects (1-4).

In the same way, those subjects of other masters that cover topics of interest for space engineering will also be considered within this matter. Finally, this matter will include, within the optional offer, regulated mentoring of students by professionals in the space sector.

Specific topics to each subject:

Big Data for Space Missions.
The program of this subject includes: statistics for data analysis; technological fundamentals in the Big Data world; optimization for large-scale data; machine learning; data analytics.

3. Big Data Processing
a. Supervised Machine Learning for Data Transmission
b. Unsupervised Machine Learning for Data Transmission
c. Data Batch Processing (Hadoop / Spark)
d. Data Processing in Streaming (Spark/Storm/Flink)
e. Big Data Storage and Management
f. Balancing Processes Architectures in backends varnish, kafka
g. Scalable Big Data Stora in NoSQL Databases cassandra / Hbase

LEARNING ACTIVITIES AND METHODOLOGY

AF1 Theoretical class
AF2 Practical classes
AF3 Practices in computer classroom
AF4 Laboratory practices
AF6 Group work
AF7 Individual student work
AF8 Evaluation activities

Code activity	Nº Total hours	Nº HoursPresencial	% Student's presence
AF1	120	120	100
AF2	60	60	100
AF3	15	15	100
AF4	15	15	100
AF6	100	0	0
AF7	430	0	0
AF8	20	20	100
TOTAL MATERIA	760	230	30

ASSESSMENT SYSTEM

EVALUATION SYSTEMS:

ASSESSMENT SYSTEMS OF THE STUDY PLAN REFERRED TO SUBJECTS

SE2 Individual or group work carried out during the course
SE3 Final exam

System of Evaluation	Minimum weight (%)	Maximum weight (%)
SE2	40%	100%
SE3	0%	60%

% end-of-term-examination: 60

% of continuous assessment (assigments, laboratory, practicals…): 40

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