

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000840 - Devices And Biometric Applications For E-health

DEGREE PROGRAMME

10AX - Master Universitario Innovación Digital Ciencia de Datos Itinerario Health

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000840 - Devices And Biometric Applications For E-Health
No of credits	4 ECTS
Type	Optional
Academic year of the programme	Second year
Semester of tuition	Semester 3
Tuition period	September-January
Tuition languages	English
Degree programme	10AX - Master Universitario Innovación Digital Ciencia de Datos Itinerario Health
Centre	10 - Escuela Tecnica Superior de Ingenieros Informaticos
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Pedro Gomez Vilda	4209	pedro.gomezv@upm.es	Sin horario. Please, ask for an appointment.
Agustin Alvarez Marquina (Subject coordinator)	4211	agustin.alvarez@upm.es	Sin horario. Please, ask for an appointment.

M. Victoria Rodellar Biarge	4205	mariavictoria.rodellar@upm.es	Sin horario. Please, ask for an appointment.
Rafael Martinez Olalla	4208	rafael.martinezo@upm.es	Sin horario. Please, ask for an appointment.

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CE-HMDA04 - Capacidad para aplicar métodos avanzados para clasificación, modelado, segmentación y predicción a partir de un conjunto de datos

CG07 - Capacidad de trabajar y comunicarse también en contextos internacionales.

3.2. Learning outcomes

RA7 - To know the applications and systems based on biometric data.

RA10 - To discover potential new health monitoring applications dealing with IoT and edge computing systems.

RA9 - To know the fundamentals of data extraction and analysis in mobile and wearable computing devices.

RA8 - To be able to deal with unstructured sources as device raw data.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

This course will introduce students into the basics of e-health applications from the point of view of device built-in sensors and focused in biometric data analysis useful for patient monitoring. Basic procedures for sensor managing for synchronous and/or asynchronous mode of operation in mobile, wearable and IoT devices will be presented. Finally, application development for different scenarios in the health domain will be reviewed.

4.2. Syllabus

1. Introduction: from devices to medical related applications.
2. Biometric signals and e-Health.
 - 2.1. Signals from common devices (e.g. mobile phones, smart wearables).
 - 2.1.1. Voice/speech.
 - 2.1.2. Gyroscope/Accelerometer data analysis.
 - 2.2. Medical oriented devices.
 - 2.2.1. Glucose scan.
 - 2.2.2. ABG reading.
 - 2.2.3. Holter monitor.
3. IoT & edge computing for e-Health.
 - 3.1. Edge computing resources.
 - 3.2. Cloud platforms for IoT.
4. Mobile application development.
 - 4.1. Review of main applications.
 - 4.2. APIs for sensor & dedicated devices.
 - 4.3. Sensor data acquisition.
 - 4.4. Data filtering and preparation.
 - 4.5. User interfaces.

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	1. Introduction to Speech and Voice Production. Duration: 02:00			
2	1. Introduction to Speech and Voice Production. Duration: 02:00			Homework. Continuous assessment Not Presential Duration: 02:00
3	2. Speech Perception. Duration: 02:00			
4	2. Speech Perception. Duration: 02:00			Homework. Continuous assessment Not Presential Duration: 02:00
5	3. Acoustic-Phonetic Parametrization of Speech. Duration: 02:00			
6	3. Acoustic-Phonetic Parametrization of Speech. Duration: 02:00			Homework. Continuous assessment Not Presential Duration: 02:00
7	4. Classification and Recognition. Duration: 02:00			
8	4. Classification and Recognition. Duration: 02:00			Homework. Continuous assessment Not Presential Duration: 02:00
9	Tema 5 Duration: 02:00			
10	Tema 5 Duration: 02:00			Homework. Continuous assessment Not Presential Duration: 02:00

11	Tema 6 Duration: 02:00			Project assignment. Continuous assessment and final examination Presential Duration: 02:00 Homework. Continuous assessment Not Presential Duration: 02:00
12	Tema 6 Duration: 02:00			Project assignment. Continuous assessment and final examination Presential Duration: 02:00 Homework. Continuous assessment Not Presential Duration: 02:00
13	Project presentation. Duration: 02:00			Project assignment. Continuous assessment and final examination Presential Duration: 02:00
14	Project presentation. Duration: 02:00			Project presentation. Continuous assessment and final examination Presential Duration: 02:00
15	Project presentation. Duration: 02:00			Project presentation. Continuous assessment and final examination Presential Duration: 02:00
16				Final exam. Final examination Presential Duration: 01:00
17				

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Homework.		No Presential	02:00	30%	0 / 10	CB07
4	Homework.		No Presential	02:00	30%	0 / 10	CB07
6	Homework.		No Presential	02:00	30%	0 / 10	CB07
8	Homework.		No Presential	02:00	30%	0 / 10	CB07
10	Homework.		No Presential	02:00	30%	0 / 10	CB07
11	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
11	Homework.		No Presential	02:00	30%	0 / 10	CB07
12	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
12	Homework.		No Presential	02:00	30%	0 / 10	CB07
13	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
14	Project presentation.		Face-to-face	02:00	30%	0 / 10	CG07 CE-HMDA04
15	Project presentation.		Face-to-face	02:00	30%	0 / 10	CG07 CE-HMDA04

6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
11	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
12	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
13	Project assignment.		Face-to-face	02:00	40%	0 / 10	CG07 CE-HMDA04
14	Project presentation.		Face-to-face	02:00	30%	0 / 10	CG07 CE-HMDA04
15	Project presentation.		Face-to-face	02:00	30%	0 / 10	CG07 CE-HMDA04

16	Final exam.		Face-to-face	01:00	30%	0 / 10	CB07 CE-HMDA04
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6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

A minimum grade of 5.0 over a total of 10 is required for completing the course.

OPTION A. CONTINUOUS ASSESSMENT GRADING.

GRADE = 30% Homework + 40% Project written report + 30% Project oral presentación.

OPTION B. FINAL EXAMINATION GRADING.

GRADE = 30% Final exam + 40% Project written report + 30% Project oral presentación.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Mobile Health: Sensors, Analytic Methods, and Applications, James M. Rehg (Editor), Susan A. Murphy (Editor), Springer, 2017, ISBN: 9783319513935	Bibliography	
The Digital Signal Processing Handbook, V. K. Madisetti, Handbook of Multisensor Data Fusion: Theory and Practice (2nd Edition), Martin Liggins II, David Hall, James Llinas, CRC Press, 2008, ISBN 9781420053081.	Bibliography	
Data Science for Healthcare. Methodologies and Applications, Consoli, Sergio, Reforgiato Recupero, Diego, Petkovic, Milan (Eds.), Springer, 2019, ISBN: 9783030052485.	Bibliography	