

DIPLOMA IN ADVANCED APPLIED TECHNOLOGIES FOR INDUSTRY

Module Description PERCETION SYSTEMS

Total contact hours	45
ECTS	5 (6 UC credits)
Taught by	Prof. Dr. Juan Pérez Oria –Coordinator- Prof. Mónica Fernández Moreno Prof. Sandra Robla Gómez
Learning goals related to	<p>Technical Competence: This course presents theoretical and practical approaches in order to acquire the basic knowledge in the principal sensors present in control systems. This module is structured in two parts. The first one is dedicated to the principles and applications of most important sensors including signal conditioning techniques. To aid understanding, it includes several examples with typical sensor specifications. The second part present an overview of concepts and professional techniques of artificial vision as the most powerful tools for perception system. The student will be introduced to the basic techniques of the field of Computer Vision. He will learn to apply Image Processing techniques.</p> <p>Methodological Competence: This course will take an analytical and practical approach to sensor for measurement and control and artificial vision but there will be a strong focus on applications in the classroom and the course work. All students are expected to actively participate in class and laboratory class.</p> <p>Personal Skills: The course will consist of lectures on the basic material coupled with examples and case studies.</p>
Content	<ol style="list-style-type: none">1. Basic principles<ul style="list-style-type: none">- Sensor systems- Sensor characteristics- Classification2. Signal conditioning and interfacing<ul style="list-style-type: none">- Signal conditioning- Passive interfacing- Instrumentation amplifier3. Measurements of motion<ul style="list-style-type: none">- Linear displacement- Angular displacement

	<ul style="list-style-type: none"> - Proximity - Acceleration <p>4. Level, height, weight and volume measurements</p> <ul style="list-style-type: none"> - Level measurement - Measurement of weight or force - Flow measurement <p>5. Measurement of pressure</p> <ul style="list-style-type: none"> - Liquid manometers - Elastic pressure sensors - Barometers <p>6. Temperature measurement</p> <ul style="list-style-type: none"> - Metal expansion and the bimetallic strip - Electrical resistance - Thermoelectricity <p>7. Image formation and representation</p> <ul style="list-style-type: none"> - Lenses - Light - Cameras <p>8. Image transformation</p> <ul style="list-style-type: none"> - Linear filters - Convolution - Edge detection - Non-linear filters <p>9. Image segmentation</p> <ul style="list-style-type: none"> - Image segmentation by clustering methods - Fitting by Hough transform - Fitting lines and curves <p>10. Recognition of image Patterns</p> <ul style="list-style-type: none"> - Classifiers - Statistic recognition - Algorithms of recognition
Teaching material	<p>▪ Texts:</p> <p>-Peter Elgar. Sensor for Measurement and Control. Addison Wesley Longman Limited. Edinburgh Gate. England 1998.</p> <p>-Ernest O. Doebelin. Measurements Systems: Application and Design. McGraw-Hill, 1996.</p> <p>-Forsyth and J. Ponce. Computer Vision-A modern approach. Prentice Hall, 2000</p> <p>-Castleman, K.R. Digital Image Processing. Prentice Hall, 1996</p>

Teaching methods	<ul style="list-style-type: none"> ▪ The class will consist of lectures on the basic material coupled with examples and case studies and an applied problem set for each section. ▪ The content of the laboratory class is structured to provide a varied learning environment. Participants will be encouraged to share their experiences and ideas and work with others to explore new ways of thinking. The module will be conducted using a mixture of lectures; small group activities; practical exercises, case studies, facilitated discussions and oral presentations.
Assessment	Student's presentations, group work activities and written exam

Workload	Magistral class	20
	Laboratory class	25
	Laboratory works	30
	Tutorials	25
	Preparation for a final written assignment:	25
International aspects	<ul style="list-style-type: none"> ▪ Use of international examples and teaching material 	
Cross-cultural reference	<ul style="list-style-type: none"> ▪ Participants of international origin. (normally) 	
Course language	<ul style="list-style-type: none"> ▪ English 	