SCIENTIFIC SYMPOSIUM & INTENSIVE COURSE "TEACHING ENGINEERING AND RENEWABLE ENERGIES"

I . Science of Machines and Mechanisms, teaching in the University of the XXI Century

Monday 16/04/2018

09:30 - 11:00 Mechanical Engineering – Part I (Dr. Juan Carlos García Prada, Dra. Cristina Castejón – UC3M)

Introduction: Industrial Engineer qualification gives its owners full capacity to project, execute and lead all kinds of facilities and operations included in the areas of industrial chemical, mechanical and electrical engineering and economics industrial. Related with these areas, the knowledge of the aspects related to the *Mechanism and Machine Science* allows the engineers to have a broad vision of the processes of generation, construction, testing and use of industrial systems. In this session, the review of the contribution of the machines and mechanisms subjects to the curricula of the engineer will be presented, drawing a special emphasis to the profiles of engineering degree in industrial technologies and engineering degree in mechanical, as well as the Master's degree in industrial engineering.

Goals:

- Know the curricula and competences of the engineers with different professional profiles.
- Know the subjects studied in each degree and master.

11:30 - 13:00 Mechanical Engineering – Part II (Dr. Juan Carlos García Prada, Dra. Cristina Castejón – UC3M)

Introduction: The subject of machine theory taught in the engineering degrees, allows the student to know, calculate, design, and select those mechanical elements of interest in industrial systems. In this second session the Teaching project in the subject called machine theory will be developed. Also, the different methodologies and the application of new trends will be exposed.

Goals:

- Know the Teaching project in machine theory.

- Learn about the methodologies used to better understanding the contents of the Machine theory.

Tuesday 17/04/2018

9:00 - 10:30 Mechanical Engineering – Part III (Dr. Juan Carlos García Prada, Dra. Cristina Castejón – UC3M)

Introduction: There are many associations related to the mechanism and machine science in different fields in order to promote the international collaboration in teaching and researching. In particular, the *International Federation for the Promotion of Mechanism and Machine Science* (IFToMM), the *Federación Iberoamericana de Ingeniería Mecánica* (FEIBIM, Ibero-American association) amongst other national associations. In this session the Organization and activities of the IFToMM will be presented.

Activities:

Campus life. Interaction of undergraduate and master's degree students with research laboratories and researchers / professors.

11:00 - 12:30 Scientific Symposium - Round Table – Parte IV

Presentation for three companies of engineering:

- INNOVA ENGINEERING, S.L. (https://energeting.net/), Mr. David Olmeda (Engineering Leader)
- ARKITHERM, S.L., Mr. Joaquín Esperón (Project Leader)
- GEOTER GEOTHERMAL ENERGY, S.L., (http://geoter.es/), Mr. Elías García Pereda (International Projects Leader)

II. Renewable Energies

Wednesday 18/04/2018

09:00 - 10:30 Solar Energy – Part I (Dra. Carolina Marugán –UC3M)

The amount of sunlight striking the earth's surface (taking into account the atmospheric transmittance) is more than enough to provide the energy needs for the humankind. Even if we consider a 10% efficiency of sunlight-to-electricity (which is much lower than commercial pv panels and much lower than concentrating thermal systems) and 1% of the earth's surface, the sun's energy would be able to provide the global needs projected for the future years.

The **goals** of the 1st session include:

- Understanding the nature of Solar Radiation.
- Evaluating the heat transfer mechanisms relevant in Solar Energy.
- Identifying the different thermal concentrators (low temperature and medium-high temperature). Special attention will be given to Flat-plate collectors for air/water heating and to concentrating solar power systems (electricity conversion).

11:00 - 12:30 Wind Energy (Dr. David Santos – UC3M)

Wind power is now successfully competing with heavily subsidized incumbents across the globe, building new industries, creating hundreds of thousands of jobs and leading the way towards a clean energy future. We are well into a period of disruptive change, moving away from power systems cantered on a few large, polluting plants towards markets increasingly dominated by a range of widely distributed renewable energy sources. We need to get to a zero emissions power system well before 2050 if we are to meet our climate change and development goals." (GWEC Secretary General Steve Sawyer).

Wind power penetration levels continue to increase, led by Denmark pushing 40%, followed by Uruguay, Portugal and Ireland with well over 20%, Spain and Cyprus around 20%, Germany at 16%; and the big markets of China, the US and Canada get 4, 5.5, and 6% of their power from wind, respectively. Some forecast sees an annual market of about 75 GW by 2021, to bring cumulative installed capacity of over 800 GW by the end of 2021.

Attendees who successfully complete this course will be able:

- To summarize the history of modern wind turbines justifying the current technology development including, large onshore and offshore schemes.
- To understand the resource assessment process.

- To understand and use the fundamental physics equations that allows converting wind energy into mechanical and electrical energy.
- To describe all wind turbines types and justify their main characteristics.
- To identify the main wind turbine manufacturers.
- To understand the main impact from high penetration levels of wind energy, and the main aspects of the grid codes developed to mitigate them.

Thursday 19/04/2018

09:00 - 10:30 Solar Energy – Part II (Dra. Carolina Marugán –UC3M)

The second session will include the following contents:

- Short introduction of the atomic structure of semiconductors and description of the photovoltaic effect.
- Description of the Silicon solar cells and the basic equations that allow determine the electric power from a solar cell or panel.
- Identification of the related equipment: batteries, inverters, charge controllers, peak-trackers.

11:00 - 12:30 Scientific Symposium - Round Table - Parte IV

(Tbc)