C3IS Course Program

New Technologies: Benefits and Applications to the Development of Society

06/07/2018 – 14/07/2018

Leganés Campus

Monday 09/07/2018	9:30-11:00
Electronic Systems and Automatic **Concepción Alicia Monje**	
Abstract: Robotics: Technological and social challenges This talk addresses the main challenges of robotics and automation and their main influences in the future world. We will talk about humanoid, social and assistive robotics, and about automation in the most important sectors of society. We will review the main leading research projects on robotics and automation in Europe and all over the world, emphasizing on the robotics platforms available from both research labs and industry. The research by the RoboticsLab group of the Carlos III University of Madrid will be taken as the background for this talk. Under this context, we will give an answer to questions such as: what are the main challenges in robotics and automation? What will be the effect of technology on the future society? Should we be afraid of robots and machines?	

Monday 09/07/2018	11:30-13:00

Computer Science Department
Lisardo Prieto

Abstract: Advances in Computer Science and their impact in Society

The evolution of Computer Science field, and the multiple synergies established with most of the knowledge areas developed by human being are providing a vast amount of solutions and new processes that help to perform better in different areas that allow optimizing costs, saving time and enabling a variety of capabilities not even imagined before.

The set of new technologies derived from the application of Computer Science solutions have even changed most of our habits, lifestyle and health in the last years. From Social Networks (increase of communication and human networking), Massive Open Online Course platforms (ubiquitous education, anytime, anywhere), Intelligent Smart Assistants, and a variety of IoT and smart devices like smartwatches, fitness trackers and smartphones, all of them empowered by complex and efficient algorithms and software systems that expands our capabilities and provide a wide range of useful daily used functionalities. However, the overall perspective looks even great. Today, Computer Science allows to predict and detect diseases in advance, and to provide the best possible known treatments, or to ensure that law enforcement officers are in the right places to maintain public safety, or automatically detect environmental problems and generate optimized strategies to mitigate such issues. Computing algorithms help organizations in all industries solve problems in novel effective ways. Artificial Intelligence techniques permit to solve extremely complex problems in a glimpse, to detect patterns and inferences that otherwise would be impossible to achieve. The application of Computer Science is changing positively our Society every day, and it does not seem that this phenomenon is going to stop. On the contrary, it is growing faster than ever.

This talk will discuss the different and most notorious recent advances in Computer Science, and their applications on how to mitigate or solve relevant societal problems.

Tuesday 10/07/2018	9:00-10:30

Thermal and Fluids Engineering

Maria Fernandez Torrijos

Abstract: Main challenges of renewable energies

The world energy demand has constantly grown throughout the years; this trend is set to continue due to the increasing population and the push from the developing countries. Actual trends in energy production and consumption are unsustainable economically, environmentally, and socially. The key advantage of renewables is that they are free of direct pollution and carbon emissions. Given concern over global warming caused by carbon emissions, there are substantial policy efforts to increase renewable penetrations. One of the challenges of renewable energies is to address the variability and uncertainty of the renewable generation into the electric grid. Flexibility can be achieved through institutional changes, operational practices, storage, demand-side flexibility, flexible generators, and other mechanism. One of the main advantages of concentrated solar power over other renewable energies is the possibility of thermal storage to better match supply with demand.

-Main lines of research in CSP
The main lines of research in CSP are power cycles, central receiver systems, parabolic trough systems and thermal energy storage.

-Energy poverty and climate change
Renewable energy technologies have features that make them especially valuable for application in remote communities, with no access to affordable, reliable, sustainable and modern energy. Besides, renewable energies avoid the production of large amounts of greenhouse gases generated by burning carbon fuels, which cause climate change and have harmful impacts on people's well-being and the environment.

Tuesday 10/07/2018	11:00-12:30

Electronic Technology Department
Vicente Salas

Abstract: Current Market and State of the Technique in Photovoltaic: 2018

Photovoltaic Energy has become one of the least expensive options for new power generation and is lower than the cost of most fossil fuel-powered generators, enabling solar installed capacity to expand faster than any other fuel. Most analysts predict that the 2017 global solar installed capacity will be around the 100 GW mark and 2018 is expected to see continued growth.

In this speech, different topic will be managed.

SOLAR MODULE TECHNOLOGIES: MONO C-SI

Multicrystalline-silicon (Multi c-Si) PV modules have dominated the global PV market over monocrystalline-silicon (Mono c-Si) due to the cost advantage, however, high efficiency Mono c-Si modules have started closing the cost gap.

According to Paula Mints, SPV Market Research, in 2016 Multi c-Si had the largest share at 54 percent of global module shipments. However, in 2017 Mono c-Si is expected to have a 49 percent share, bypassing Multi c-Si.

Mints said that in 2016 manufacturers began adding passivated emitter rear contact (PERC) mono (P-type) capacity because it offers more margin control through slightly better manufacturing costs and an ability to slightly increase prices. New additions of mono PERC capacity began coming online in 2017.

"The trend is mono's taking more market share and it will continue in 2018. PERC has become a mature technology and will be put more in mass production," stated a spokesperson for JinkoSolar, a vertically integrated solar manufacturer. LG Solar, another solar company, echoed the trend of Mono c-Si, but with N-type.

In terms of technological innovations in modules, LG is looking at bifacial modules and AC modules, by utilizing N-type Mono-Si as the fundamental technology. JinkoSolar also considers N-type and bifacial to be hot technology

in 2018. Bifacial modules can utilize light from both sides and therefore significantly increase the electricity yield of PV systems.

Besides LG and JinkoSolar, a growing number of PV manufacturers have engaged in development of high efficiency bifacial modules. According to SPV Market Research, shipments of bifacial modules are expected to be less than 1 percent of global solar shipments in 2017 but will increase with utility-scale deployment.

INVERTER: 1500-VOLT AND BIGGER STRING INVERTERS

As PV projects continue to trend toward larger systems, three-phase string and higher voltage inverters have started gaining a market share in large C&I and utility-scale markets.

A major trend of the inverter technology is the shift to 1500-volt DC systems, instead of 1000-volt DC systems in utility projects. Sungrow has developed both string and central inverters rated at 1500-volt DC.

Another trend is that string inverters are getting bigger and bigger in capacity, and low capacity central inverters are being replaced gradually, even in utility-scale applications.

It is true that three-phase string inverters are gaining more and more attention in recent years, especially for C&I applications. For large-scale installation, central inverters are still the first choice. It's hard to decide which type of inverters are gaining more market share as more varied PV applications are being developed and inverter selection should take the actual conditions into consideration.

In fact, last year Sungrow released a virtual central inverter concept, which combines the benefit of the command and control of central inverters with the lower O&M of string inverters for utility-scale markets.

The company currently offers the world's most powerful 1500-volt string inverter rated at 125 kW, which can support up to a 12-MW power block design while maintaining 99 percent maximized efficiency. The size for string inverters is expected to be even bigger in the near future, according to the company.

Central inverters are also increasing in size. The company offers 1,500-volt central inverters with a total capacity of 2.5 MW and 3 MW and is developing a 3.125 MW central inverter, which will support up to a 12.5 MW block design.

DISTRIBUTED GENERATION MARKET: GROWTH EXPECTED

Although utility-scale solar has been the biggest market segment, distributed generation (DG) is expected to start picking up.

DG market is growing fast globally, especially in China and the U.S.

There is strong evidence of a shift from large-scale solar to DG — maybe not in absolute volume but definitely in growth percentage. This can be attributed to a variety of issues associated with utility-scale solar from transmission cost to curtailment to availability of land. This shift is evident in countries such as EU, Japan, China, and the U.S.," said Chang of LG. Both bifacial and AC modules should enable DG to grow more.

Wednesday 11/07/2018	9:00-10:30

Materials Science Department
Paula Alvaredo

Abstract: New Challenges of Materials in Society

The importance of materials in society goes back to the principles of humanity. Historically, the development and evolution of communities have been intimately linked to the ability of their members to produce and shape the materials necessary to satisfy their needs. Such that the prehistorians have found it useful to classify the different civilizations from the materials used during each one: Stone Age, Copper Age, Bronze Age or Iron Age.

Although for us the different materials (metals, plastics, ceramics, glasses, cements, etc.) are familiar, Material Science is a new science. It was accepted for the first time as a true scientific and academic discipline in 1958, for which the previous development of physics, chemistry and other basic sciences was necessary.

In the development of many of the recent advances of the last fifty years in communications, information technologies, transportation, health, civil engineering, energy industry, consumer goods, etc., the development of the materials has been the main driving force. The knowledge of new metal alloys, advanced ceramics, polymers, synthetic fibers or composite materials has been possible to achieve many technological milestones.

Nowadays, the main research lines in Materials Science could be classified in three different groups: Transport, Energy and Health. Thanks to the research carried out in these three fields, some cutting-edge projects are being developed, such as the development of the fusion nuclear reactor, the generation of skin through additive manufacturing techniques, the substitution of bone pieces in a safer and more effective way, the development of cleaner and safer transport ...

However, the future present to us several challenges as the development of sustainable technologies for the production and consumption of energy, transport and communications; and in order to address them, new materials with increasingly specific properties are needed. Despite the great progress

made to date, there is still a long way to go. With the help of modern microscopes and computational calculations, we will be able to create new materials with the sophisticated properties that today's society demands and we are likely to find ourselves facing a forthcoming *Revolution of Materials*.

Wednesday 11/07/2018	11:00-12:30

David Pérez
Bioengineering and Aerospace Engineering Department

Abstract: Bioengineering, from nanoscale to the service of medicine

Bioengineering is in a broad sense the interface of medicine and a wide range of engineering principles to understand, modify, or control living systems.

From the ancient Greek when biosignals were sensed by doctors to the irruption of Nuclear Physics in the early 20th century which set the basis of the current imaging modalities such as X-Ray, Magnetic Resonance Imaging or Positron Emission Tomography, the interest has been focused on understanding the structures and functions of the body. The body has been already completely mapped whereas its the function, especially the brain, is still the last frontier.

Fields likes biomedical imaging made a breakthrough in the 70's and 80's and currently the research effort is driven to merge existing techniques, improve the image quality and reduce imaging time. Others, like tissue engineering in symbiosis with molecular engineering are capable nowadays to explain mechanisms of aging, human development, the origins of cancer and mental illness thanks to recent studies up to a scale of nanometer.

The present and near future is certainly the combination of multidisciplinary fields. However, one can picture that the every field in engineering will be re-furnished with the advent of new computer generation.