

## SHORT COURSES

### **EVALUATION AND CONTROL OF THE TRIBO-MECHANICAL PROPERTIES OF VAPOR-DEPOSITED COATINGS AND THIN FILMS**

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Economic and environmental concerns require that modern equipment be designed with ever more stringent performance criteria, pushing components to the very limits of their capabilities, while being able to operate in a large variety of harsh conditions including corrosive, abrasive or high temperature and pressure environments. Consequently, there is a strong need to develop new material systems that will allow components to maintain their structural integrity while being able to withstand the multitude of aggressions that can occur in service. Because material degradation processes often occur at or near the surface of components, surface engineering can be used to locally modify properties. However, in order to design the appropriate protective system, it is of paramount importance to understand how these materials behave, how such surface treatments or coatings affect the underlying structural material and ultimately how they fail. Using this knowledge, novel material systems can then be designed for optimal performance by finding new chemistries, controlling microstructure or designing new architectures.

In this short course, we will discuss how plasma-based protective coatings can locally improve mechanical and tribological properties of the underlying structural materials. First, we will overview mechanical and tribological characterisation techniques in order to better interpret the relationships existing between degradation mechanisms and surface mechanical response. Subsequently, we will outline the design and selection process of protective coatings with a discussion on the selective tailoring of coating mechanical properties such as hardness, elastic modulus or toughness through deposition process control and coating system architectural design.