Course Syllabus

Department/Faculty: School of Engineering

Graduate Program: Materials Engineering and Nanotechnology

Degree
☒ Academic Master's ☒ Doctorate (PhD) ☐ Professional Master's

Course Name:
Surface Engineering

Professor:
Prof. Dr. Marcos Massi

Office hours:
48

Course Overview:

The discipline deals with surface modification processes and their applications, relating their technological advances obtained promoted by different processes. It deals with the state of the art in nanotechnology applied to the nano and microelectronics, space, automotive, health sectors. Aspects related to the processes of deposition, corrosion and functionalization of materials are presented. The main surface characterization techniques are also studied.

Topics outline:

1. Surface properties of materials.
2. Nucleation and growth processes of thin films.
3. Fundamentals on plasma science and technology.
4. Deposition processes: PVD, PECVD, ALD, Ion-Beam.
5. Thermochemical processes: nitriding and carbonitriding plasma.
6. Cathodic spraying.
7. Corrosion processes of thin films: Reactive Ion Etching.
8. Surface operation by plasma technology.
9. Characterization and analysis of surfaces: roughness, adhesion, contact angle, surface energy.

Letter Grade Assignment
Grade A (Excellent) - Grade points between 9 and 10
Grade B (Good) - Grade points between 8 and 8.9
Grade C (Satisfactory) - Grade points between 7 and 7.9
Grade D (Unsatisfactory) - Grade points between 0 and 6.9

Texts, Materials, and supplies

GRILL, A. *Cold Plasma in Materials Fabrication: from fundamentals to applications.* Piscataway, NJ: IEEE Press; New York: Institute of Electrical and Electronics Engineers, c1994.

GREENE, J. E. *Tracing the recorded history of thin-film sputter deposition: From the 1800s to 2017.* J. Vac. Sci. Technol. A 35(5), Sep/Oct 2017.

MOZETIC,M. et al. *Recent developments in surface science and engineering, thin films, nanoscience, biomaterials, plasma science, and vacuum technology.* Thin Solid Films 660, 2018, 120-160.

OHRING, M. *The Materials Science of Thin Films*, San Diego, Academic Press, 1992.

AGHAJANI, H.; BEHRANGI, S. *Plasma Nitring of Steels.* Switzerland: Springer, 2017.

PINNA, N.; KNEZ, M.. *Atomic Layer Deposition of Nanostructured Materials.* Singapore: Wiley-VCH, 2012.

RICKERBY, D.S.; MATTHEWS,A.. *Advanced Surface Coatings: a Handbook of Surface Engineering.* New York, 1991.