**COURSE SYLLABUS**

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| **Course Title**：Vacuum Thin Film Technology | | | | |
| **Credits/Hours** | 3 /3 | **Course Number** | 158042 | **□Required ■Elective** |
| **Course Description**  This course covers the fundamental and thin-film growth aspects, basic vacuum science and technology, plasma, sputtering and other physical vapor deposition methods, chemical vapor deposition, epitaxy, and thin film properties. | | | | |
| **Topics** | | | | |
| **Topic** | | **Content** | | |
| Introduction to Vacuum Thin Film Technology | | 1. Introduction to thin films and their applications  2. Fundamental aspects  3. Thin-film growth aspects | | |
| Vacuum Science and Technology | | 1. Introduction  2. Popular types of vacuum pumps  3. Pumping System | | |
| Plasma | | 1. Plasma definition and characteristics  2. Plasmas, Discharges, and Arcs  3. Fundamentals of Plasma Physics  4. Reactions in Plasmas | | |
| Sputtering | | 1. DC, AC, and reactive sputtering processes  2. Magnetron sputtering  3. High power impulse magnetron sputtering (HiPIMS) | | |
| Physical Vapor Deposition (PVD) | | 1. Thermal evaporation  2. Electron beam evaporation  3. Laser ablation  4. Ion beam assisted evaporation  5. Molecular beam epitaxy | | |
| Chemical Vapor Deposition (CVD) | | 1. Reaction types  2. Thermodynamics of CVD  3. Gas transport  4. Film growth kinetics  5. Thermal CVD processes  6. Plasma-enhanced CVD processes  7. Some CVD Materials Issues | | |
| Epitaxy | | 1. Epitaxial Relationship, Lattice misfit, growth modes.  2. Types and sources of defects in epitaxial films  3. Epitaxy of Compound Semiconductors | | |
| Film properties | | 1. Film structures  2. Crystallinity, adhesion, roughness, damage  3. Film surface properties  4. Tensile and compressive stress  5. Modification of film properties | | |