**Global Learning Initiatives Program Course Syllabus**

Please complete the following form in English. The information will be updated to the Global Learning Initiatives Program website for students’ reference. If you will be offering more than one course, please fill out one form per course offered. Examples in grey.

**Course Information**

|  |  |
| --- | --- |
| Course Name  \*provide the **English** course name of the course. | Principles and Applications of Materials Characterization Techniques |
| Lecturer(s)  \*provide the lecturers’ **English** name. If there are more than one lecturer, please indicate all lecturers in the column. | Yu-Sheng Su, Ph.D. |
| Course Description  \*briefly describe the contents covered in the courses. | Semiconductor materials can be widely adopted in not only electronic devices/integrated circuits but also energy storage devices (Li-ion batteries) and solar cells. The focus of the lectures will be the analytical methods on materials but not devices, which can be applied to other physical and chemical scientific research topics. This course was designed for young semiconductor talents who are interested in characterization technologies applied in semiconductor materials. |
| Course Objectives  \*list out knowledge or skills students should acquire upon completion of course. | Students will learn various characterization techniques for semiconductor materials including XRD, SEM/TEM, Cryo-EM, AFM, thermal, BET, XPS, UV-vis, Raman, FTIR, EIS, Mass, NMR, etc. |
| Suggested Proficiencies  (if any)  \*list preferred knowledge or skills students should have before taking the course. | Students with a science or engineering (Physics, Chemistry, Materials, Electronics) degree can take this course. |
| Reading List  (if any)  \*list out the textbooks, references, or other reading materials. | N/A |
| Grading Criteria  \*how would the students be assessed during the course. | Attendance (10%);  Homework Assignments (20%);  Quiz (20%);  Mid-term Exam (30%);  Final Exam (30%) |

**Course Schedule**

Please complete the following table with the dates and expected course topics. If there are more than one lecturers instructing the course, please also indicate the lecturer for each class.

|  |  |  |  |
| --- | --- | --- | --- |
| Class | Date (YYYY/MM/DD) | Course Topic | Lecturer |
| 1 | 2022/2/14 | Introduction to Semiconductor Materials – Warmup | Yu-Sheng Su |
| 2 | 2022/2/21 | X-ray Diffraction (XRD) Analysis (I) | Yu-Sheng Su |
| 3 | 2022/2/28 | National Holiday | Yu-Sheng Su |
| 4 | 2022/3/7 | X-ray Diffraction (XRD) Analysis (II) | Yu-Sheng Su |
| 5 | 2022/3/14 | Electron Microscopy (EM) and Elemental Analysis (I) | Yu-Sheng Su |
| 6 | 2022/3/21 | Electron Microscopy (EM) and Elemental Analysis (II) | Yu-Sheng Su |
| 7 | 2022/3/28 | Advanced Cryo- and In-Situ Electron Microscopy (EM) | Yu-Sheng Su |
| 8 | 2022/4/4 | Spring Break | Yu-Sheng Su |
| 9 | 2022/4/11 | Mid-term Exam | Yu-Sheng Su |
| 10 | 2022/4/18 | Atomic Force Microscopy (AFM) | Yu-Sheng Su |
| 11 | 2022/4/25 | Thermal Analysis、Particle Size Analysis、Surface Area (BET) and Porosity | Yu-Sheng Su |
| 12 | 2022/5/2 | X-ray Photoelectron Spectroscopy (XPS)、Ultraviolet-visible Spectroscopy | Yu-Sheng Su |
| 13 | 2022/5/9 | Raman Spectroscopy、Fourier-Transform Infrared Spectroscopy (FTIR) | Yu-Sheng Su |
| 14 | 2022/5/16 | Electrochemical Analysis、Electrochemical Impedance Analysis (EIS) | Yu-Sheng Su |
| 15 | 2022/5/23 | Mass Spectrometry、Nuclear Magnetic Resonance (NMR) Spectroscopy | Yu-Sheng Su |
| 16 | 2022/5/30 | Final Exam | Yu-Sheng Su |