

MS IN PHYSICS - CONCENTRATION IN PHOTOVOLTAICS

This National Professional Sciences Master's Association (NPSMA) recognized degree program is designed for students who want to work in the photovoltaics (PV) industry upon graduation. It prepares master's students with a strong foundation in the fundamentals of PV science and technology. It complements science education through management course work directly relevant to business aspects of manufacturing. It exposes students to a range of research activities on the UToledo campus in laboratories of world-expert faculty in PV. Placement of students as interns in PV manufacturing facilities for six months to enhance their practical training and employability is a critical part of the program. There is no thesis requirement for this degree.

The Photovoltaics concentration is designed for students with an undergraduate degree in Physics, Chemistry, an Engineering discipline (e.g. Electrical, Chemical, or Mechanical), or an otherwise related field.

| Code | Title | Hours |
|------------------------------|---|-------|
| PHYS 6280 | Photovoltaic Materials And Device Physics Laboratory | 3 |
| PHYS 6630 | Semiconductors I | 3 |
| PHYS 6640 | Fundamentals of Solar Cells | 3 |
| PHYS 6940 | Industrial Internship | 6 |
| PHYS 6960 | M.s. Thesis Research | 3-5 |
| PHYS 6990 | Independent Study | 3 |
| Select two of the following: | | 6-8 |
| PHYS 6250 | Classical Electrodynamics I | |
| PHYS 6320 | Quantum Mechanics I | |
| PHYS 6520 | | |
| PHYS 6540 | Structure, Defects And Diffusion | |
| PHYS 6550 | Thermodynamics And Phase Transformations In Condensed Systems | |
| PHYS 6980 | Special Topics | |
| Select two of the following: | | 6 |
| BUAD 6400 | Results-Based Management | |
| BUAD 6600 | Supply Chain Management | |
| CHEE 6010 | Green Engineering Principles | |
| CIVE 5690 | Sustainability Engineering | |
| EFSB 6590 | New Venture Creation | |
| EFSB 6690 | Strategic Management of Innovation | |
| GNEN 6700 | Management of Projects and Technological Innovation | |
| INFS 6560 | Business Systems Analysis and Design | |
| OSCM 5520 | | |
| PHYS 6980 | Special Topics | |

No thesis is required; however, students are expected to make an oral presentation based on research and independent study.

- PLO 1: Students will analyze and solve (using the appropriate analytical techniques) any advanced graduate problem of relevance to photovoltaics (condensed matter physics, semiconductors, materials science, materials characterization, and device physics).
- PLO 2: Students will analyze and critique the appropriateness of various manufacturing techniques used in the production of solar cells. Our students must also be able to determine the correct experimental methods to be used in analyzing the manufacturing techniques.
- PLO 3: Students will critique any publication from the area of solar cells.
- PLO 4: Students will demonstrate oral and written communication skills appropriate to the study of photovoltaics.
- PLO 5: Students will analyze which physical processes are relevant to a given system.
- PLO 6: Students will assess cause and effect in physical systems by formulating evidence-based logical arguments.
- PLO 7: Students will perform research procedures relevant to photovoltaic materials and device development and industrial implementation.
- PLO 8: Students will identify and evaluate relevant informational resources appropriate to their field of study.
- PLO 9: Students will demonstrate ethical scientific and academic conduct.
- PLO 10: Students will demonstrate collaboration skills in a scientific context, in particular, with the M.S. advisor, research group members, and at their internship.