

DEPARTMENT OF PHYSICS – KATZ SCHOOL

# MASTER OF SCIENCE DEGREE IN PHYSICS

**PROGRAM MISSION STATEMENT, PROGRAM GOALS AND OBJECTIVES, CURICULUM MAP, AND OUTCOME ASSESSMENT**

# MISSION STATEMENT

The Master of Science degree in Physics will prepare students for PhD level graduate work in Physics or Engineering, or for a science-related career in education or industry. Students in this program develop strong analytical, quantitative, and problem-solving skills, including a deep appreciation for connections between physics and scientific computing, physics and engineering, and physics and mathematics, that serve to expand their career options in computer hardware/software companies, large semiconductor industries and non-science jobs such as finance, law, business, and health.

M.A. in Physics students can focus their studies in two ways: academic or industrial.

* Academic Focus**:** With an academic focus, students build strong credentials for applying to top Ph.D. programs in physics and engineering and to increase the chances of securing full financial support in those programs.
* Industrial Focus**:** With an industrial focus, students develop strong tools to transition into high-end industrial jobs in the STEM field. In addition to taking applied physics and engineering courses from the academic track, students may take up to 6 credits in mathematics, business, or finance.

# GOALS and OBJECTIVES

1. Students will be able to understand physical principles behind natural phenomena.
   1. Students will be able to define key physical concepts and terminology.
   2. Students will be able to identify key physical laws and how they explain observed phenomena.
2. Students will be able to analyze scientific problems, generate logical hypotheses, evaluate evidence, and tolerate ambiguity.
   1. Students will be able to apply the steps of the scientific method to identify significant problems, develop and test hypotheses, and collect, analyze, and communicate data.
   2. Students will be able to collect and compare multiple sources of evidence on a research topic.
3. Students will be able to effectively communicate scientific knowledge using their own informed perspectives both orally and in writing.
   1. Students will be able to produce presentations for their peers in class setting and/or conferences
   2. Students will be able to write reports based on the material learned in class and/or in research.
4. To prepare students for success in industry and academia.
   1. Students will be able to demonstrate appropriate competence and a working knowledge of

mechanics, electricity and magnetism, thermodynamics, optics, atomic physics, solid state physics, statistical mechanics, and quantum mechanics.

* 1. Students will be able to demonstrate competence in the physics laboratory, including a working knowledge of basic electronics and the ability to work independently.
  2. Students will be able to demonstrate the ability to identify and apply the appropriate analytic, numerical, computational, and other mathematical tools necessary to solve physics and engineering problems.

# CURRICULUM MAP

To earn the M.A. in Physics, students must complete 30 credits from the following courses. All courses are 3 credits, except for Research in Physics which can be from 3 to 9 credits per semester. Courses can be taken in any order.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SLO | EGR/PHY 5321  Electromagn etic Theory | EGR/PHY 5322  Electrom agnetic Theory 2 | EGR/PHY 5301  Computati onal Physics and Engineerin g | EGR/PHY 5303  Mathemat ics for  Physics and Engineerin g | EGR 5221  Engineeri ng Mechani cs | EGR 5222  Engineerin g Mechanic s 2 | EGR 5810  Advanc ed Physics and Engineeri ng Laborato  ry | EGR/PHY 5510  Applied Statistical Thermodynamics | EGR 5621  Quantum Engineering | EGR 5622 Quantum  Engineering 2 | EGR/PHY 5036  Complex Systems in Science and Engineering | EGR 5935  Quantum Heterostru ctures | PHY 5912  Research in Physics |
| 1a | x | x | x | x | x | x | x | X | x | x | x | x | x |
| 1b | x | x | x | x | x | x | x | X | x | x | x | x |  |
| 2a | x | x | x | x | x | x | x | X | x | x | x | x | x |
| 2b | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 3a | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 3b | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 4a | x | x | x | x | x | x | x | X | x | x | x | x | x |
| 4b |  |  |  |  |  |  | x |  |  |  |  |  |  |
| 4c | x | x | x | x | x | x | x | X | x | x | x | x | x |