

# PHYSICS

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## Learning Outcomes

### Master of Education (M.Ed.)

1. **KNOW:** Graduates will demonstrate mastery in physics core knowledge and research methodologies that underpin the practice of modern physics. Mastery is defined as the ability to define and explain principles, recognize their application in physical phenomena, and to choose and apply appropriate principles and mathematical tools to set up and solve physics problems. Graduates will be able to apply physics concepts and combine them with high-level mathematical methods to solve problems.
2. **PROFESSIONAL PRACTICE:** Graduates will (i) know and understand professional standards of ethics and conduct, (ii) be able to analyze situations to identify the standards that should apply and (iii) will be able to describe how they may be appropriately acted upon.
3. **COMMUNICATE:** Graduates will demonstrate the ability to communicate professionally, in written form, research work and conclusions to physics sub-field expert and non-expert audiences.
4. **THINK:** Graduates will be able to summarize modern methods in physics education and curricular development for physics education.
5. **APPLY/CREATE:** Graduates will be able to apply foundational knowledge and methods to a specific research problem, they will be able to summarize the primary literature directly connected to it and to analyze and judge new contributions to the primary literature in the same area.

### Master of Science (M.S.)

1. **KNOW:** Graduates will demonstrate mastery in physics core knowledge and research methodologies that underpin the practice of modern physics. Mastery is defined as the ability to define and explain principles, recognize their application in physical phenomena, and to choose and apply appropriate principles and mathematical tools to set up and solve physics problems. Graduates will be able to apply physics concepts and combine them with high-level mathematical methods to solve problems.
2. **PROFESSIONAL PRACTICE:** Graduates will (i) know and understand professional standards of ethics and conduct, (ii) be able to analyze situations to identify the standards that should apply and (iii) will be able to describe how they may be appropriately acted upon.
3. **COMMUNICATE:** Graduates will demonstrate the ability to communicate professionally, in written form, research work and conclusions to physics sub-field expert and non-expert audiences.
4. **THINK:** Graduates will be able to summarize (i) several outstanding problems or questions in diverse subfields of physics, (ii) the experimental, observational, or theoretical origins of these problems, and (iii) the principal efforts proposed or underway to address them.
5. **APPLY/CREATE:** Graduates will be able to apply foundational knowledge and methods to a specific research problem, they will be able to summarize the primary literature directly connected to it and to analyze and judge new contributions to the primary literature in the same area.

### Doctor of Philosophy (Ph.D.)

1. **KNOW:** Graduates shall demonstrate advanced knowledge and understanding in physics core knowledge (statistical mechanics, theoretical mechanics, classical electrodynamics, and quantum

physics) and experimental, observational, and theoretical methodologies, that underpin the practice of modern physics.

2. **THINK:** Graduates shall demonstrate, at a level appropriate to a departmental colloquium, (i) knowledge of several outstanding problems or questions in diverse sub-fields of physics, (ii) the experimental, observational, or theoretical origins of these problems, and (iii) the principle efforts proposed or underway to address them.
3. **COMMUNICATE:** Graduates shall demonstrate the ability to communicate professionally, in written and oral form, research work and conclusions to physics sub-field expert and non-expert audiences.
4. **PROFESSIONAL PRACTICE:** Graduates shall demonstrate (i) knowledge and understanding of professional standards of ethics and conduct, (ii) the ability to analyze situations to identify the standards that should apply and (iii) describe how they may be appropriately acted upon.
5. **APPLY/CREATE:** Graduates shall have a specialty area within the broad domain of physics, within which they shall demonstrate (i) advanced knowledge and understanding of the primary literature, (ii) the ability to analyze and judge new contributions to the primary literature, (iii) the ability to pose complex research problem(s) and identify the knowledge and methodologies required to address them, and (iv) the ability to apply that knowledge and those methodologies to create new knowledge and/or develop new experimental techniques that advance (or show the potential to advance) knowledge and understanding within the specialty area.