

**487 Philosophy of Mathematics**  
Fall of odd years. 3(3-0) RB: (PHL 330) or three courses in mathematics.

Nature of mathematical truth and knowledge. Theses of logicism, formalism, intuitionism, and conventionalism.

**490 Independent Study**  
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Approval of department.

Supervised special projects arranged by an individual student and a faculty member in areas supplementing regular course offerings.

**491 Special Topics in Philosophy**  
Fall, Spring, Summer. 3 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.

Special topics supplementing regular course offerings, proposed by faculty on a group study basis.

**492 Seminar for Majors (W)**  
Fall. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: Completion of Tier I writing requirement. RB: 16 credits in Philosophy. R: Open only to juniors or seniors in the Department of Philosophy or approval of department.

Advanced, variable topic seminar for undergraduate majors. Seminar presentations. Substantial paper.

**499 Senior Thesis Research (W)**  
Fall, Spring. 3(3-0) P:M: Completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Philosophy. Approval of department.

Individual research project supervised by a faculty member that demonstrates the student's ability to do independent research and submit or present a major paper.

**800 Proseminar in Philosophy**  
Fall. 3(3-0) R: Open only to master's students in the Department of Philosophy or approval of department.

The practice of graduate and professional work in philosophy: reading, writing, presentation, critique and revision; rigor of argument and clarity of expression; areas and methods of inquiry; cooperation and dialogue in inquiry; conferences, professional activities, and employment.

**801 Teaching Philosophy**  
Spring. 3(3-0) R: Open only to Ph.D. students in Philosophy or approval of department.

Theoretical and pedagogical issues in teaching philosophy: the nature of philosophy, designing a course and syllabus, lecturing, leading discussions, designing assignments, evaluation, classroom dynamics, using technology, teaching various areas of philosophy.

**810 Seminar in the History of Philosophy**  
Fall. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Major thinkers, themes, periods, or movements in the history of philosophy.

**820 Seminar in Continental Philosophy**  
Fall of even years. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Major figures or themes in 19th and 20th century continental philosophy.

**840 Seminar in Value Theory**  
Spring. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Major figures, themes, or periods in ethics or aesthetics. Topics vary.

**850 Seminar in Social and Political Philosophy**  
Spring of even years. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Major figures, themes, or periods in social and political philosophy. Topics vary.

**860 Seminar in Metaphysics and Epistemology**  
Fall. 2 to 4 credits. A student may earn a maximum of 15 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Selected topics in metaphysics, epistemology, and philosophy of mind.

**870 Seminar in Philosophy of Health Care**  
Fall. 2 to 4 credits. A student may earn a maximum of 15 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Ethical, political, theoretical, and methodological issues in medicine and health care.

**880 Seminar in Philosophy of Science**  
Spring. 2 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in Philosophy or approval of department.

Selected topics in the philosophy of the special sciences, in the metatheory of science, and in the social studies of science.

**890 Independent Study**  
Fall, Spring, Summer. 1 to 10 credits. A student may earn a maximum of 20 credits in all enrollments for this course. R: Approval of department.

Special projects, directed reading, and research arranged by an individual graduate student and a faculty member in areas supplementing regular course offerings.

**894 Practicum in Philosophy of Health Care**  
Fall, Spring. 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: (PHL 344) R: Open only to graduate students in Philosophy or approval of department.

Study of ethical and policy issues in hospital and governmental agency settings.

**899 Master's Thesis Research**  
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Approval of department.

Directed research leading to a master's thesis in partial fulfillment of Plan A master's degree requirements.

**999 Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 75 credits in all enrollments for this course. R: Approval of department.

Doctoral dissertation research.

## PHYSICAL MEDICINE AND REHABILITATION PMR

### Department of Physical Medicine and Rehabilitation College of Osteopathic Medicine

**501 Osteopathic Manipulative Medicine I**  
Fall. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. R: Open only to students in the College of Osteopathic Medicine.

Basic osteopathic palpatory skills. Building on their basic palpatory skills, students will learn skills in the osteopathic manipulative treatment areas of counterstrain and muscle energy.

**502 Osteopathic Manipulative Medicine - II**  
Spring. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. P:M: (OMM 501) R: Open only to students in the College of Osteopathic Medicine.

Students will continue to learn skills in the osteopathic manipulative treatment area of muscle energy as well as high velocity low amplitude (mobilization with impulse).

**503 Osteopathic Manipulative Medicine - III**  
Summer. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. P:M: (OMM 502) R: Open only to students in the College of Osteopathic Medicine.

Students will use their palpatory skills as they learn the principles of functional (indirect) and myofascial release osteopathic manipulative treatment.

**504 Osteopathic Manipulative Medicine - IV**  
Fall. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. P:M: (OMM 503) R: Open only to students in the College of Osteopathic Medicine.

Basic cranio-sacral osteopathic manipulative medicine. Exposure to various osteopathic approaches to the extremities.

## Physical Medicine and Rehabilitation—PMR

**505 Osteopathic Manipulative Medicine - V**  
Spring. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. P:M: (OMM 504) R: Open only to students in the College of Osteopathic Medicine.

Use of patient complaints/conditions to integrate material presented in OMM 501, 502, 503, 504 while preparing the student for OMM 506.

**506 Osteopathic Manipulative Medicine - VI**  
Summer. 1(0-2) Interdepartmental with Osteopathic Manipulative Medicine. Administered by Department of Osteopathic Manipulative Medicine. P:M: (OMM 505) R: Open only to students in the College of Osteopathic Medicine.

The osteopathic component in the context of total patient care in disorders of various systems.

**590 Special Problems**  
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

Each student works under faculty direction on an experimental, theoretical or applied problem in physical medicine and rehabilitation.

**601 Physical Medicine and Rehabilitation Clerkship**  
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.

Physical medicine and rehabilitation inpatient and ambulatory setting clinical experience, didactic sessions, case documentation and presentation, hospital rounds. Strong emphasis on evaluation of neuromusculoskeletal disorders and treatment of function deficits.

**620 Directed Studies**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to juniors or seniors in the College of Osteopathic Medicine. Completion of Semester 6 in the graduate-professional program.

Individual or group projects on special problems related to physical medicine and rehabilitation.

**806 Advanced Neuroscience Techniques Laboratory**  
Summer. 3(0-9) Interdepartmental with Neuroscience; Psychology; Pharmacology and Toxicology; Radiology. Administered by Department of Neuroscience. P:M: (NEU 804 or concurrently) RB: (PHM 827 and ANT 839 and PSY 811) R: Open only to doctoral students in the Neuroscience major.

Methods of neuroscience research and the underlying principles on which these methods are based.

**102 Physics Computations I**  
Spring. 1(0-3) P:M: (PHY 183 or concurrently or PHY 183B or concurrently or PHY 193H or concurrently or PHY 181B or concurrently) RB: (CSE 101 or CSE 231)

Use of Mathematica to solve, analyze and graph equations and data from mechanics.

**170 Investigations in Physics**  
Fall. 3(0-6) R: Approval of department. Experiments in optics, electronics, sound and mechanics; analysis of data using computers, library research and oral presentations.

**181B Basic Physics I**  
Fall, Spring, Summer. 3 credits. P:M: (MTH 132 or MTH 152H or LBS 118) Not open to students with credit in LBS 271 or PHY 183 or PHY 183B or PHY 193H or PHY 231 or PHY 231B or PHY 231C, PHY 233B.

Newton's laws of motion, conservation of momentum and angular momentum, energy conservation, thermal physics, waves, and sound. This course is given in the competency based instruction format.

**182B Basic Physics II**  
Fall, Spring, Summer. 3 credits. P:M: (PHY 183 or PHY 183B or PHY 181B or LBS 271 or PHY 193H) or (PHY 231 or concurrently and PHY 233B) or (PHY 231B or concurrently and PHY 233B) and (MTH 133 or MTH 153H or LBS 119) Not open to students with credit in LBS 272 or PHY 184 or PHY 184B or PHY 232 or PHY 232B or PHY 294H.

Electricity and magnetism, optical phenomena, interference and diffraction of light, atomic and subatomic topics. This course is given in the competency based instruction format.

**183 Physics for Scientists and Engineers I**  
Fall, Spring. 4(5-0) P:M: (MTH 132 or MTH 152H or LBS 118) Not open to students with credit in LBS 164 or PHY 181B or PHY 183B or PHY 193H or PHY 231 or PHY 231B.

Mechanics, Newton's laws, momentum, energy conservation laws, rotational motion, oscillation, gravity, waves.

**183A Physics I**  
Fall, Spring, Summer. 1 credit. P:M: (PHY 181B) Not open to students with credit in LBS 271 or PHY 183 or PHY 183B or PHY 193H or PHY 231 or PHY 231B or PHY 231C.

Topics from: frames of reference, special relativity, rocket equation, forced oscillations, resonances, fluid motion, numerical solutions, moments of inertia, gyroscopic motion. This course plus PHY 181B is equal to PHY 183B. This course is given in the competency based instruction format.

**183B Physics for Scientists and Engineers I**  
Fall, Spring, Summer. 4 credits. P:M: (MTH 132 or MTH 152H or LBS 118) Not open to students with credit in LBS 271 or PHY 181B or PHY 183 or PHY 193H or PHY 231 or PHY 231B or PHY 231C.

Mechanics, Newton's laws, momentum, energy conservation laws, rotational motion, oscillation, gravity, waves. This course is given in the competency based instruction format.

**184 Physics for Scientists and Engineers II**  
Fall, Spring. 4(5-0) P:M: (PHY 183 or PHY 183B or PHY 193H or PHY 233B or PHY 183A) or (LBS 164 and PHY 233B) and (MTH 133 or MTH 153H or LBS 119) Not open to students with credit in LBS 267 or PHY 182B or PHY 184B or PHY 232 or PHY 232B or PHY 294H.

Electricity and magnetism, electromagnetic waves, light and optics, interference and diffraction.

**184A Physics II**  
Fall, Spring, Summer. 1 credit. P:M: (PHY 182B) Not open to students with credit in PHY 184 or PHY 184B or PHY 232 or PHY 232B or PHY 294H, PHY 232C or LBS 272.

Topics from: standing wave phenomena, atoms, electromagnetic fields, alternating currents, optics, quantum mechanics, elementary particles. This course plus PHY 182B is equivalent to PHY 184B. 182B is exactly 3/4 of 184B and 184A is the other 1/4. This course is given in the competency based instruction format.

**184B Physics for Scientists and Engineers II**  
Fall, Spring, Summer. 4 credits. P:M: (PHY 183 or PHY 183B or PHY 193H) or (PHY 181B and PHY 183A) or (PHY 231B and PHY 233B) or (LBS 271 and PHY 233B) RB: (MTH 133 or MTH 153H or LBS 119) Not open to students with credit in LBS 272 or PHY 182B or PHY 184 or PHY 232 or PHY 232B or PHY 294H.

Electricity and magnetism, electromagnetic waves, light and optics, interference and diffraction. This course is given in the competency based instruction format.

**191 Physics Laboratory for Scientists, I**  
Fall. 1(0-3) P:M: (PHY 183 or concurrently or PHY 183B or concurrently or PHY 193H or concurrently or PHY 231 or concurrently or PHY 231B or concurrently or LBS 271 or concurrently or PHY 181B or concurrently) Not open to students with credit in PHY 251 or LBS 271L.

Error analysis, exercises in motion, forces, conservation laws and some electricity and magnetism studies.

**192 Physics Laboratory for Scientists, II**  
Spring. 1(0-3) P:M: (PHY 191 or MSM 211 or MSM 250) and (PHY 184 or concurrently or PHY 182B or concurrently or PHY 184B or concurrently or PHY 294H or concurrently or PHY 232 or concurrently or PHY 232B or concurrently or LBS 272 or concurrently) Not open to students with credit in PHY 252 or LBS 272L.

Electric and magnetic fields, circuits, wave optics, modern physics.

**193H Honors Physics I-Mechanics**  
Spring. 3(4-0) P:M: (MTH 133 or concurrently or MTH 153H or concurrently or LBS 119 or concurrently) Not open to students with credit in PHY 183 or PHY 183B or PHY 231 or PHY 231B or LBS 164 or PHY 181B.

Mechanics and waves.

**201 Physics Computations II**  
Fall. 1(0-3) P:M: (PHY 184 or concurrently or PHY 184B or concurrently or PHY 294H or concurrently) RB: (MTH 133 and PHY 102)

Computer methods to analyze and visualize physics problems. Tools used will include programming languages (Fortran) and mathematical software (Mathematica, etc).

## PHYSICS

## PHY

### Department of Physics and Astronomy College of Natural Science

**101 Concepts in Physics**  
Fall. 1(1-0)

Conceptual foundations of physics emphasizing key experiments.