

Physics

www.ndsu.edu/physics/

Department Chair: Dr. Sylvio May

Graduate Coordinator: Dr. Alan Denton

Department Location: 218 South Engineering

Telephone Number: (701) 231-8974

Degrees Offered: Ph.D., M.S.

Application Deadline: For U.S. students, one month before registration; for international students, March 1 for fall semester and September 1 for spring/summer semester.

Test Requirements: GRE (general and subject recommended)

English Proficiency RA-TOEFL iBT 79, IELTS 6

Requirements: TA- TOEFL iBT 81 (Speaking 23, Writing 21), IELTS 7 (Speaking 6, Writing 6)

Program Description

The Department of Physics offers graduate study leading to the M.S. and Ph.D. degrees. Advanced work may involve specialized training in the following areas: biophysics, computational physics, condensed matter, laser applications, optics, chemical physics, soft matter, statistical mechanics, physics education and polymer physics.

Research and academic programs are tailored to meet individual needs and interests. Soon after their arrival, new students are strongly urged to visit faculty members to discuss research opportunities.

Admissions Requirements

The Department of Physics graduate program is open to all qualified graduates of universities and colleges of recognized standing.

Financial Assistance

The student must apply to the Graduate School and be accepted in full or conditional status before being eligible for an assistantship in the Department of Physics.

Generally, graduate students are supported during the academic year by either teaching assistantships or research assistantships. The 2014-2015 academic year stipend is \$16,000 for 9 months. Additional support during the summer is also possible. Graduate tuition (except for student activity fees) is fully waived for all teaching assistants and research assistants.

Research Equipment

The following equipment is available for research: global positioning system, picotesla magnetometry equipment, work stations; computer clusters, resources at the NDSU Center for High-Performance Computing; Nd:YAG, and titanium: sapphire lasers; immediate access to scanning electron microscope; low- and high-field NMR; and X-ray powder diffractometer, materials processing lasers and a full complement of materials characterization equipment through the NDSU Center for Nanoscale Science and Engineering.

Master of Science

The Graduate Coordinator or Chair shall assign to each incoming graduate student a temporary advisor, who shall assist in the selection of courses. During the first semester, the student is expected to discuss

potential projects for thesis research with faculty members. By the beginning of the second semester, the student must have a permanent research supervisor. By the end of the second semester, the student must have filed a plan of study, selected a thesis topic, and secured two additional faculty members for the Advisory Committee.

Master of Science

Each student must earn at least 30 graduate credits, numbered 601-798, of which:

- at least 10 credits are Physics courses numbered 601-689 or 700-789;
- at least 16 credits are didactic courses numbered 601-689 or 700-789;
- between 6 and 10 credits are Physics 798 (Master's Thesis);
- at least one credit must be Physics 790 Graduate Seminar.

Students are required to attend all seminars and colloquia.

Doctor of Philosophy

The Ph.D. program requires the completion of at least 90 graduate credits, numbered 601-799. Credits used to satisfy the requirements for the M.S. degree may be included in the total:

- 27 or more must be in letter-graded courses
- 19 are the required physics courses (655, 752, 758, 761, 771, 781, and 790)
- No more than 12 credits are in non-physics courses

Students are required to attend all seminars and colloquia.

Comprehensive Examination

By the end of their fourth semester, students:

- hand in a report that summarizes their research results so far and details a research plan for the rest of their research work
- give a talk about their research accomplishments and plans
- must pass an oral examination by the Advisory Committee to confirm doctoral candidacy

Students who pass the comprehensive examination and, at the time of the exam, have completed 30 credits (16 of which are didactic) will earn a Master's degree and be eligible to participate in commencement that semester. Students should choose the Ph.D. + Master's option from the drop-down menu on the Doctoral Degree Plan of Study and on the Request to Schedule Examination. After students have passed the comprehensive examination, they should complete the Exit Survey and the Degree Application. A link to these items will be e-mailed to them by the Graduate School.

If the student fails the comprehensive examination, she/he will be given the opportunity to repeat the examination in the next semester (this examination can be repeated only once). Alternatively, the student may elect to work for a Master's degree instead.

Students should submit their doctoral thesis for examination at the end of their fourth year.

Dissertation Video

Doctoral students are required to submit a three-minute video summarizing their dissertation research for a lay audience. The video

should be produced, with guidance from the thesis supervisor, during the final semester of study and presented to the supervisory committee at the final defense.

For the comprehensive and final examinations, students must submit the appropriate forms to the Graduate School.

Students must meet all requirements of the Physics Bachelor of Science and Master of Science programs. For the Master's degree, students must earn at least 30 graduate credits, numbered 601-798, with these conditions:

- At least 21 credits are didactic Physics courses from this list. Up to 15 credits from this list may count toward the Bachelor program requirements. It is recommended that students take the 600-level of PHYS 455/655, 462/662, 485/685, and 486/686 while fulfilling the requirements for the Bachelor's degree.

PHYS 611	Optics for Scientists & Engineers
PHYS 611L	Optics for Scientists and Engineers Lab
PHYS 613	Lasers for Scientists and Engineers
PHYS 615	Elementsof Photonics
PHYS 655	Classical Mechanics
PHYS 662	Heat & Thermodynamics
PHYS 663	Statistical Mechanics
PHYS 681	Introduction to Solid State Physics
PHYS 685	Quantum Mechanics I
PHYS 686	Quantum Mechanics II
PHYS 752	Mathematical Methods in Physics I
PHYS 758	Statistical Physics
PHYS 761	Electromagnetism
PHYS 771	Quantum Physics I
PHYS 781	Solid State Physics
PHYS 782	Condensed Matter Physics

- Between 6 and 8 credits are PHYS 798 Master's Thesis, with the goal to publish a paper based on the thesis research, although this is not a requirement to graduate.
- At least one credit is PHYS 790 Graduate Seminar.

Warren Christensen, Ph.D.

Iowa State University, 2007

Postdoctoral: University of Maine, 2007-2009

Research Interests: Physics Education Research, Student Content Understanding, Curriculum Development

Yongki Choi, Ph.D.

The City University of New York, 2010

Postdoctoral: University of California Irvine, 2010-2014

Research Interests: Nano-Bio-physics, Nano-electronics, Single-Molecule science

Andrew Croll, Ph.D.

McMaster University, 2009

Postdoctoral: University of Massachusetts, 2008-2010

Research Interests: Polymers, Diblock Copolymers, Thin Films, Pattern Formation, Mechanics

Alan R. Denton, Ph.D.

Cornell University, 1991

Postdoctoral: University of Guelph, 1991-94; Technical University of Vienna, 1994-95, Research Center Julich, 1996-98

Research Interests: Soft Condensed Matter Theory, Computational Physics

Eric Hobbie, Ph.D.

University of Minnesota, 1990

Research Interests: Nanotechnology, Nanoparticles, Polymers, Optics and Rheology

Thomas Ihle, Ph.D.

Technical University, Aachen, 1996

Postdoctoral: University of Paris, 1995-96; Grenoble 1997; University of Minnesota 1998-2000

Research Interests: Theory and Simulation of Complex Fluids Kinetic Theory, Pattern Formation

Andrei Kryjevski, Ph.D.

University of Washington, 2004

Research Interests: High Energy Partical Theory, Nuclear Theory, FirstPrinciples Numerical Techniques for Fermi Systems

Mila Kryjevskaja, Ph.D.

University of Washington, 2008

Research Interest: Physics Education

Sylvio May, Ph.D., Department Chair

Friedrich-Schiller University, 1996

Research Interests: Physics of Lipid Membranes, Biophysics

J. Bruce Rafert, Ph.D.

University of Florida, 1979

Postdoctoral: University of South Florida, 1979-1980

Research Interests: W Serpentis Stars, Autonomous Observatories, Hyperspectral Remote Sensing Physics

Orven Swenson, Ph.D.

Air Force Institute of Technology, 1982

Research Interests: Laser Materials Processing, Optics Education

Alexander J. Wagner, Ph.D.

University of Oxford, 1997

Postdoctoral: MIT, 1998-2000, Edinburgh, 2000-2002

Research Interests: Computational Soft Matter , Phase Separation, Diffusion, Interfaces Physics

Emeritus

Ghazi Q. Hassoun, Ph.D.

University of Minnesota, 1963

Postdoctoral: University of Michigan, 1963-65

Research Interests: Foundations of Quantum Mechanics

Daniel M Kroll, Ph.D.

University of Chicago, 1973

Research Interests: Theoretical and Computational Modeling of Complex Fluids and Biomembranes

Charles A. Sawicki, Ph.D.

Cornell University, 1975

Postdoctoral: Cornell University, 1975-79

Research Interests: Acoustics, Biophysics, Geophysics

Mahendra K. Sinha, Ph.D.

Pennsylvania State University, 1961

Postdoctoral: National Research Council (Ottawa), 1964-66

Research Interests: Field Emission and Field-Ion Microscopy Adjunct

Adjunct Faculty

Stuart Croll, Ph.D.

University of Leeds, UK, 1974

Research Interests: Weathering Durability, Film Formation, Internal Stresses In Films, Modern Art Conservation, and History of Paint Technology

Kenneth Lepper, Ph.D.

Oklahoma State University, 2001

Research Interests: Applied Solid State Physics (geologic materials) and Materials Characterization

Konstantin Pokhodnya, Ph.D.

Moscow Institute of Science and Technology, 1977

Research Interests: Materials, Thin Film Fabrication, Spintronics

Gary D. Withnell, Ph.D.

North Dakota State University, 1980

Research Interests: Biophysics