GRADUATE STUDENT

HANDBOOK

Department of Physics

Virginia Polytechnic Institute
and State University

August 2015

Note:.

The policies in this Handbook apply

to students entering Virginia Tech

in Fall 2007 or later.

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General Policies and Procedures

The Physics department offers M.S. and Ph.D. degrees in physics and in several inter-disciplinary areas. Requirements vary somewhat, but the expectation is that the M.S. should be completed in two years and that the Ph.D. will require an average of five to six years past the B.S. degree in physics. The following regulations supplement the rules in the Graduate School Catalog and the Graduate School's Procedural Guidelines, see: http://www.graduateschool.vt.edu/graduate_catalog/

All entering students are expected to attend the Graduate School's Orientation Week according to the schedule provided by the Graduate School. Student's holding Graduate Assistantships are required to attend a mandatory GTA Workshop given by the Graduate School (details are given in the Graduate School's Orientation Schedule). The Physics Department strongly encourages *all* incoming students, even without departmental support, to attend the mandatory GTA Workshop in the fall of their incoming year. (These workshops are currently only offered at the beginning of each academic year.) Failure to attend and comply with the GTA Workshop's requirements could jeopardize possible GTA support.

All incoming international graduate students are required to take the English Placement Test (EPT) during the orientation period prior to the beginning of classes unless they have:

- A PBT TOEFL score of 620 paper AND an essay writing score (Test of Written English) of 4.5 or higher
- A CBT TOEFL score of 260 paper AND an essay writing score (Test of Written English) of 4.5 or higher
- An iBT total score of 105 AND a writing score of 26 or higher

Those students who have obtained either a bachelor's or a master's degree from an accredited university in a country where English is the native language may request a test waiver in writing to *lci-info@vt.edu*. A scanned official transcript or diploma from the institution stating that the medium of instruction was English must be provided with all such requests.

Students who do not achieve the necessary scores on the EPT are required to take and satisfactorily complete a semester-long Advanced Academic Writing course during their first semester of their enrollment at Virginia Tech along with their full load of academic classes (9-18 credit hours). There is an additional fee for this course (which includes the textbooks), taught by the Virginia Tech English Language Institute (ELI).

International Graduate Teaching Assistants (GTAs) must pass a SPEAK or TEACH test before they can begin their instructional duties. The department recommends physics graduate students take the **TEACH** test. Students who do not pass must take English

0014, Oral Communication for International Teaching Assistants (1 credit hour) during the semester prior or concurrent with their teaching assignment. The SPEAK and TEACH Test is administered individually during the Orientation Period, in addition to the mandatory GTA Workshop.

All entering students are required to attend the Physics Department's graduate student orientation, usually on the morning of the first day of the mandatory GTA Workshop offered by the Graduate School each fall semester. Students will be informed of the date, time, and place of the workshop by the Graduate School's GTA Workshop and the Departmental Orientation session once the departmental offer has been accepted by the student. Each incoming student is assigned to a faculty member of the Graduate Committee who will serve as the student's *temporary* advisor. The faculty member will monitor the student's academic progress and will be available for advice and consultation. Students can only drop a class with their (temporary) advisor's or the Graduate Committee Chair's consent.

Academics

General Requirements

The University requirements for the M.S. and Ph.D. degrees are stated in detail in the Graduate School catalog. They include course credits and submission of a Plan of Study.

All graduate students must submit a Plan of Study that meets at least the minimum Graduate School requirements for the designated degree. The Plan of Study must be approved by the student's Advisor and Advisory Committee, the Graduate Program Director or Department Head, and the Graduate School. All courses on the Plan of Study, including supporting courses, must be taken on a letter grade (A/F) basis except for those courses approved to be graded on a pass-fail (P/F) basis only. Audit courses cannot be included on the Plan of Study. After approval by the student's Advisory Committee and the Graduate Program Director or Department Head, the Plan of Study will be entered and sent electronically to the Graduate School for approval, according to the following schedule.

Master's: The Plan of Study is due by the end of the second academic semester for all Master's degree students (based on full time enrollment of 12 credits per semester**). For students in the Accelerated Undergraduate Graduate Degree Program in Physics the Plan of Study is due by the end of the first full semester of graduate study.**

Ph.D.: The Plan of Study is due by the end of the third academic semester for all doctoral students (based on full time enrollment).

Transfer Courses on the Plan of Study. No more than 50% of the graded credit hours needed to satisfy the requirements for a Virginia Tech graduate degree may be transferred in from a regionally accredited university. All such credits must have earned grades of

"B" or better, have been earned while in good standing in graduate status, and must have been graduate courses (numbered 5000 or higher) at the institution where the student took the courses. Grades of "S" or "P" are not acceptable for transfer credit. All transfer courses must be acceptable to the student's Advisory Committee and the Graduate Program Director or Department Head. For transfer course work more than five years old, a Justification of 'Old' Course Work form must be filed with the Plan of Study (see below).

Credits from other universities are transferred to a Virginia Tech graduate degree at the time the Plan of Study that includes those courses is approved by the Graduate School. Transferred courses count only as credit hours and are not included in the calculation of the Virginia Tech GPA. Official transcripts are required before transfer course work can be approved for the Plan of Study.

Transfer credits should be arranged with the Graduate Committee upon first arrival at Virginia Tech, but no later than the end of the student's first semester. Although a physics Ph.D. student may bypass the M.S. degree, all students are strongly encouraged to obtain at least the non-thesis M.S. degree when the requirements are fulfilled.

The Ph.D. Advisory Committee should be composed of a minimum of four members. The advisory committee chair or co-chair and two of the committee members should be regular Virginia Tech physics faculty. The corresponding M.S. committee should have three members. The advisory committee chair or co-chair and one of the committee members should be regular faculty. Any non-physics faculty member needs to be approved by the Physics Department Graduate Committee.

Grades on Plan of Study Courses. All graded courses on the Plan of Study must be taken for a letter grade (A/F) except for those courses offered on a pass/fail (P/F) basis only (for example, Independent Study courses and many seminars are only P/F). Students must maintain a 3.0 GPA or better on the Plan of Study course work. Once a course on the Plan of Study is taken for a grade, it must remain on the Plan of Study (see below).

Repeating Courses on the Plan of Study. Students are required to repeat any courses on the Plan of Study in which a grade below "C-" has been earned. Courses may not be repeated if a "P" grade or a grade of "C" or better is earned. After a course has been repeated, the grade for the first enrollment will be Repeat Graduate (RG, defined as a 'C-' or lower; RP, defined as a grade of C or higher when the course was first taken). Only the most recent enrollment in the course will receive a letter grade and be calculated in the GPA.

All physics graduate students are bound by the rules of the University's Graduate Honor System, which is described in the Graduate School catalog see http://graduateschool.vt.edu/academics/expectations/index.html

Degree requirements include courses, both required and elective, thesis research, and examination(s). The credit requirement for a Ph.D. is 90 hours, including a maximum of 60 hours of research and dissertation. For the M.S. there are two options, thesis and non-

thesis, both of which require 30 credit hours. In the non-thesis option at least 24 hours of course work are required, while the thesis option requires at least 20 hours of courses and 6-10 hours of thesis research, respectively.

All first year students are required to take the Phys 5944 Seminar (1 hour, 1 credit, pass/fail) course, in the fall **AND** the spring semester of their first year. In the fall semester, to pass, a student must attend at least 10 seminar or colloquia *and* give a 10-15 minute presentation (towards the end of the semester, usually the day before Reading Day) on the topic of either one of these seminars/colloquia or recent (published within the last 5 years) journal articles. The topic of the student's choice should be on a level that their fellow students can follow. In the spring semester students are required to submit a written version of their presentation (10-15 pages with specified format), including relevant literature. Students are expected to adhere to the standard rules and style of scientific writing (proper citations and references, no colloquialisms, etc.).
The paper must give proper credit and cite all relevant sources. The paper can be based on work performed before enrolling at Virginia Tech, but must in that case credit former collaborators and advisers. The student must be the sole author of the paper, which should be written after enrolling at Virginia Tech--an edited version of an older paper is not acceptable.
Requirements accompanying the specific degrees are discussed in the appropriate sections below.

Degrees in Physics

The following physics courses constitute the core courses, required of students in both the M.S. and Ph.D. programs.

Course No.	Title	Hours
5354	Classical Mechanics	3
5405-6	Classical Electromagnetism	6
5455-6	Quantum Mechanics	6
5705	Statistical Mechanics	3
	Total Course Hours	**18**

These are normally taken during the first year of graduate study and must be completed by the end of the second year. A minimum grade point average of 3.0 must be maintained in all course work.

Master of Science (M.S.)

There are two options in this program: *non-thesis* and *thesis*. In the former option, only course work is required. In the latter, between 6 and 10 hours of research toward the thesis is required.

Course Requirements

The specific course requirements are:

Course No.	Title	Hrs., non-thesis	Hrs., thesis
	Core (six courses)	18	18
5705	Statistical Mechanics	3	-
5714	Methods of Theoretical Physics	3	3
	Electives	9	≥2
	Total Course Hours	**30**	**≥20**

Of the electives, up to 6 hours in the non-thesis option (5 hours in the thesis option) may be Independent Study (Physics 5974). Any electives numbered below 5000 need to be approved by the Graduate Committee.

Thesis

A student choosing the thesis option is encouraged to seek out as much information as possible about the activities of the faculty before choosing a research advisor. M.S. theses completed in earlier years may serve as a guide (more recent ones are available only via http://scholar.lib.vt.edu/theses/index.html). Of course, a student should talk with each faculty member in whose work he/she may have a potential interest. Like the Ph.D. dissertation, a M.S. thesis represents a written communication of the original research findings.

Final Examination

Every student ought to pass a qualifying examination and should be prepared to answer questions in the core areas of physics (e.g., classical mechanics, electrodynamics, quantum mechanics statistical mechanics, and modern physics) at the advanced undergraduate level. Students who complete a thesis can, in addition to the qualifying exam, give an oral defense of their research (rougly comparable to a prelim).

Doctor of Philosophy (Ph.D.)

Course Requirements

The *minimum* course requirements for the Ph.D. in physics are:

Course No.	Title	Hours
	Core (six courses)	18
5714	Methods of Theoretical Physics	3
	Electives at 5000 Level or above	9
	Total Course Hours	**30**

All students are required to take 18 hours of core courses and Methods of Theoretical Physics. Exceptions are granted (for those with appropriate qualifications or a MS degree), provided a student passes the final examination (or its equivalent) given in the preceding semester at Virginia Tech (with a grade of B+ or higher). If a student transfers with their faculty advisor to Virginia Tech, the Graduate Committee may waive the core course placement exam requirement.

According to the requirements of the Graduate School, a maximum of 60 hours of research credit may be counted towards the minimum of 90 hours necessary for the Ph.D. degree.

Preliminary Examination

Students are encouraged to seek a potential thesis advisor as soon as possible after entering the program, and to form a Ph.D. Advisory Committee by May of their first academic year. This will serve to prepare the students for the pre-defense exams, which consist of two equally important, independent parts:

(a) The **qualifying exam**, which is an examination on general physics, at the upper undergraduate level;

(b) The **preliminary exam**, which consists of a presentation of and examination on the background material and preliminary research the student has performed.

Both exams are oral and are expected to last approximately 1.5 hours each. They are normally administered on the same day, but if necessary (for example if a student has not managed to form an Advisory committee during his or her first year of graduate school) they may be given on separate occasions. Students must pass the qualifying exam BEFORE they can schedule the preliminary exam. Students are expected to perform satisfactorily on both exams in order to be allowed to proceed toward a Ph.D. Therefore, students must pass both exams before the Graduate School is informed that he or she has satisfied the requirements of the preliminary exam. If a student fails one of the exams, but passes the other, only the failed exam needs to be re-administered.

Students are required to attempt the qualifying examination by the end of their third semester in the program, and the preliminary examination no later than by the end of their fifth semester. These time limits can be extended by the graduate committee if good cause is demonstrated. Examples of reasons to extend time limits include: debilitating medical conditions, medical conditions that require hospitalization, the birth of a child, data loss caused by mechanical failure. The committee will consider each student request on a case-by-case basis.

If a student fails the first attempt at the qualifying examination, he or she is allowed a second attempt at the earliest convenience but not later than the following semester. If a student fails the first attempt at the preliminary examination, one full semester (a minimum of 15 weeks) must elapse before the second attempt is scheduled. In case of failure at the second attempt, students will not be allowed to continue toward a Ph.D., but may remain in the program to obtain a M.S. degree in Physics.

Both exams are usually administered by the student's Advisory Committee, except that the primary research advisor will not take part in administering or evaluating the qualifying exam. If the Advisory Committee is not formed in time, the qualifying exam will be administered by the Graduate Committee. However, the student must form an Advisory Committee before the preliminary exam can be administered.

In the interest of fairness and uniformity, one or two members of the Graduate Committee should serve on both exams, and the Advisory Committee will if necessary be temporarily augmented by members of the Graduate Committee for purposes of satisfying this requirement.

These rules are designed to ensure that students pass the qualifying examination no later than by the end of their second academic year in the Ph.D. program, and the preliminary examination by the end of their third year. If a student fails to meet these time limits, he or she will not be allowed to continue toward a Ph.D., but may remain in the program to obtain a M.S. degree in Physics. The time limits can be extended, at the discretion of the Graduate Committee, but *only* if the extension is granted *before* the time limits have expired, and extenuating circumstances beyond the student's control exist. In particular, failure to form an Advisory Committee in time to meet the limits is not grounds for an extension.

In part (a) examination on general physics, at upper undergraduate level, the student is expected to have a firm and well-integrated understanding of undergraduate physics and the mathematical methods involved. Questions in classical mechanics, electrodynamics, quantum mechanics, statistical and modern physics (including special theory of relativity) are likely to be posed. Texts demonstrating the level and coverage of the material include:

- Baierlein, R., *Newtonian Dynamics* (McGraw-Hill)
- Symon, K. R. *Mechanics* (Addison-Wesley)
- Fowles & Cassiday, *Analytical Mechanics* (Thompson)

- Griffiths, *Introduction to Electrodynamics* (3rd Edition, Addison-Wesley)
- Lorrain, P., and Corson, D. R.,
  Electromagnetic Fields and Waves (Freeman)
- Thornton, S. T., and Marion, J. B., *Classical Dynamics of Particles and Systems* (5th edition, Brooks Cole Publishing)
- Reitz, J. R., Milford, F. J. and Christy, R. W.,
  Foundations of Electromagnetic Theory (Addison-Wesley)
- Griffiths, *Introduction to Quantum Mechanics (*2nd Edition, Addison-Wesley)
- Liboff, R. L., *Introductory Quantum Mechanics* (Addison-Wesley)
- Eisberg, R., and Resnick, R.,
  Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles (Wiley)
- Krane, K. S., *Modern Physics* (Wiley)
- Tipler & Llewellyn, *Modern Physics* (W. H. Freeman)
- Young, *University Physics with Modern Physics* (12th Edition, Addison-Wesley)
- Giambattista & Richardson, *College Physics* (McGraw)
- Schroeder, Daniel V., *An Introduction to Thermal Physics* (Addison-Wesley)
- Baierlein, Ralph, *Thermal Physics* (Cambridge University Press)
- Cowan, Brian, *Topics in Statistical Mechanics* (Imperial College Press)
- Kittel, C. and Kroemer, H., *Thermal Physics* (W. H. Freeman)
- Hecht, E., *Optics* (4th Edition, Addison-Wesley)

Part (b) consists of a presentation of the background material for the student's envisioned thesis, and, if applicable, a summary of his/her preliminary research.

Should irreconcilable differences between the student and the advisor emerge, both the advisor and the student must inform the graduate committee in writing. A second student committee must be formed by the end of the second year. Passing the preliminary exam must be completed by the end of the third academic year.

If a student fails to form an Advisory Committee *and* to pass the preliminary examination by the end of the third academic year (in the Ph.D. program), pursuing the Ph.D. in physics at Virginia Tech is not possible.

Dissertation and Final Examination

For most graduate students, research is the most important and satisfying experience of their graduate education. Under the supervision of a member (or members) of the Advisory Committee, the student pursues original research in some area of physics, developing many of the skills necessary for a career in physics: proposing and defining a problem, carrying out the investigations and performing the analyses, as well as arriving at justifiable conclusion and communicating the results in both written (dissertation) and oral (final examination) forms.

To insure a timely progression, a student should, immediately upon enrollment in the Ph.D. program, begin to investigate potential dissertation research areas. Useful sources of information include seminars and colloquia, faculty, postdoctoral researchers, and

other graduate and undergraduate students carrying out research in the department, and reports/papers published by the research groups. A good way to study an area in greater depth is to sign up for research hours or independent study under the supervision of a faculty member. The first part of the preliminary examination is an opportunity for the student to present a proposal for his or her planned research.

All students are required to complete an annual progress to degree report toward the middle of each spring semester. The student completes his/her part, signs, and submits the report to his/her advisor. The advisor adds his/her input and, signs it and shares the report with the student. Students must submit a copy of their annual progress report to members of their advisory committee. The student must submit the original signed copy to the Graduate Committee. One year or so prior to the Ph.D. dissertation defense, students are expected to convene their advisory committee and present/report on their research progress; e.g. this could happen in the framework of a departmental seminar. Upon completion of the dissertation, the students' Advisory Committee will conduct the final examination, which will consist of an oral defense of the dissertation.

Degrees with Interdisciplinary Options

The department offers several interdisciplinary options. These include Mathematical Physics and Physics Education. A student in one of these options should form an Advisory Committee with a majority from the regular faculty of the Virginia Tech Physics Department (3/4 for Ph.D. and 2/3 for M.S.). As in the regular degree programs, all candidates must pass the final exanimation.

Mathematical Physics (M.S. and Ph.D.)

The mathematical physics option is designed to provide the student with knowledge of advanced mathematics far greater than normally appears in typical physics curricula, so that the student is more adequately prepared than one in the regular option for mathematical study of fundamental physics. It will also appeal to the student with a strong interest in applied mathematics and in applying methods of mathematical physics to new problems that may arise in their careers. This option may be taken through either the Physics or Mathematics departments. The curriculum described here applies to the option taken through the Physics department; electives should be chosen from the list below .

The course requirement for the Ph.D. degree is:

Course No.	Title	Hours
	Core (six courses)	18
5225-6 (M)	Real analysis	6
5235-6 (M)	Complex analysis	6
6255-6 (M)	Functional analysis	6
6755-6 (X)	Math. Foundations of Quantum Mechanics (when offered)	6
	Total Course Hours	**30**

Courses with (M) are in the Mathematics department and those with (X) are cross-listed in Physics and Mathematics. Recommended electives include

Course No.	Title
5706	Statistical Mechanics
5707	Advanced Classical Mechanics
6455-6	Advanced Quantum Mechanics
4124, 5125-6 (M)	Algebra
5425-6 (M)	Applied Partial Differential Equations
5435-6 (M)	Principles & Techniques of Applied Mathematics
5245-6 (M)	Ordinary Differential Equation

Thesis and dissertation research is carried out under the auspices of the Center for Statistical Mechanics and Mathematical Physics, and Theoretical Chemistry an interdisciplinary entity in the Physics, Mathematics, and Chemistry departments.

For students pursuing the M.S. degree in this option, the Physics 5714 requirement is normally replaced by mathematics courses such as Real Analysis (Math 5225-6) and/or Functional Analysis (Math 6255-6). Other required physics courses may be replaced by the cross-listed Quantum Mechanics (6755-6). This tract is particularly suitable for those wishing to obtain a M.S. in Physics and a Ph.D. in Mathematics, and Chemistry.

Financial Support

Graduate Students entering the physics program may be granted support upon admission. Typically, this support is in the form of a GA/TA appointment from the department. After a student passes the Preliminary Examination, he/she is often supported by an RA from the advisor's research group. In extraordinary cases, a research group may offer RA support from the beginning.

Graduate/Teaching Assistant (GA/TA)

Incoming graduate students holding a GTA must have attended the mandatory GTA training workshop. This program is designed to prepare the graduate students for their GTA duties. There are also additional training sessions given by the faculty in charge of laboratories in the Department to which you may be assigned. Students are required to attend these sessions as scheduled by the faculty to whom they are assigned.

Assignments and Duties

Assignments will be made by the Associate Chair, in consultation with the Department Chair. The Physics Department expects the graduate students who have accepted GTA positions to take their teaching responsibility seriously. GTAs should each hold at least one office hour per week when they can meet with their students. Lab Instructors will have orientation meetings with students who have laboratory assignments. GTAs must work through the laboratory assignments before they meet their lab sections.

The nominal service required for a G/TA can be up to, but should not exceed, 20 hours per week. The activities included are preparation, grading, office hours, and other student contact. The estimated time allotted for the completion of each should be agreed upon before the semester begins. The instructor of the course and the Associate Chair should be informed as soon as possible if these estimates are not according to the guidelines given above.

Faculty members in charge of specific GTAs will present semester reports on the performance of each GTA to the Graduate Committee and the Department Chair. The evaluation form will contain areas for the faculty member to evaluate the student's performance, for the student to comment about the evaluation, and signature lines for the student and the faculty member. These evaluations will be put in the student's file. Upon graduation, the student will have the option of having all evaluations either destroyed or kept in a permanent file.

Eligibility for and Duration of Support

To be eligible for such support by the department in the following year, a regular student in any graduate program in physics must satisfy the following criteria for Minimum Academic Progress in the current year:

- Year 1: pass 5354, 5405-6, and 5455 (physics core courses), 5714 (Methods of Theoretical Physics) with GPA ≥ 3.0, total GPA ≥ 3.0; pass 5944 (seminar course).
- Year 2: (M.S.) no support is provided beyond the second year; (Ph.D.) pass 5456 (physics core course), and 5705 with GPA ≥ 3.0 (total GPA ≥ 3.0) and the qualifying examination.

- Years 3 and 4 (Ph.D.): pass preliminary examination and present one seminar on progress with research.

Priority for support will be given to those students with a physics core GPA's of ≥ 3.0. A student enrolled in the M.S. program may be supported beyond the second year if he/she switches over to the PhD program. In this case, the Graduate Committee must be informed in writing, by December 1st of the second year. For Ph.D. students, GTA support is not normally provided beyond the fifth year. Exceptions will be considered by the Graduate Committee, on a case by case basis.

Research Assistant (RA)

A Research Assistant is supported by individual faculty members or research groups. The duties are specified by the research supervisor. Although there are exceptions, RA's are usually offered to students that have passed the Preliminary Examinations. Students on RA support during the academic year when they are signed-up for research credit hours should fulfill both the obligations of the RA support and their credit hour requirements. Details should be discussed with their research advisor, and may vary.
All students are encouraged to seek RA support as early as possible in their graduate careers.

Graduate Honor System

All students are expected to abide by the Graduate Honor System. The Graduate Honor Code establishes a standard of academic integrity that all graduate students at Virginia Tech are expected to uphold. You are encouraged to familiarize yourself with it. Details are available at http://graduateschool.vt.edu/academics/expectations/index.html.

Graduate Committee

The Graduate Committee consists of faculty members, one student representative and Betty Wilkins, who is in charge of Graduate Student Services. A graduate student with particular concerns about any aspect of the graduate program is encouraged to speak to any member of this committee.

Faculty Membership

At present, the faculty members of the Graduate Committee are:

Duncan Farrah
Jonathan Link
Vinh Nguyen
Kyungwha Park
Mark Pitt
Hans Robinson
Eric Sharpe (Graduate Committee Director)

Graduate Student Representative

The Graduate Committee has one graduate student member, who serves as a voting member for a period of one year. At the time of appointment, the student must have passed the Preliminary Examination. In the beginning of each academic year, the graduate student body will elect up to three candidates, all of whom have agreed to serve. The Graduate Committee will then select one of these elected candidates as its graduate student member. The selected student will be the representative of the graduate student body for the academic year in which he/she was selected.

Current graduate student representative: Shadi Esmaeili

Admission to the Graduate School

Admission to the Graduate School is contingent upon receipt of a BS/BA degree from an accredited university or college, an undergraduate cumulative grade point average of 3.0/4.0, and presentation of evidence of potential to do graduate work. Specifically, 20 credit hours of physics courses, excluding general physics and including modern and thermal physics and junior/senior level mechanics, electricity and magnetism, and quantum mechanics; a grade point average in physics and math of at least 3.0 (B) during the last two years; and courses in math through vector calculus and partial differential equations are required. Students who lack some of the prerequisite courses may be

considered for admission but will have to remedy the deficiencies during their first year of graduate study.

It is required that all prospective graduate students take the GRE Aptitude and Advanced Physics Examinations before applying for admission. If circumstances prevent this, students will be required to take the examinations at the first offering after enrolling at Virginia Tech, unless given a specific exemption by the Graduate Committee.

International students must take the TOEFL. A minimum score of 550 paper/213 computer-based/80 iBT is required be the Graduate School; however, to be competitive for financial support by the department students should have scores above 600 paper/250 computer-based/100 iBT. As mentioned at the beginning of this handbook, all international students are required to take the English Placement test, which is administered through the Graduate School, upon enrollment at Virginia Tech. Those students who lack proficiency will be required to complete satisfactorily a remedial English course. All international students on Graduate Teaching Assistantships are expected to pass the TEACH or SPEAK-test administered by the Graduate School during their first year at Virginia Tech, to continue qualifying for financial support. The department recommends that students take the TEACH test.

Prior to submitting the online application, individuals are encouraged to review the requirements and conditions for admission. A list of degrees and their requirements are available at http://www.grads.vt.edu/academics/programs/index.html
Applications for admission should be made on-line at:
http://graduateschool.vt.edu/admissions/applying/index.html

Supplemental application materials, namely GRE general and subject scores and TOEFL (where applicable) should be sent directly to the Graduate School (please instruct ETS to have your scores sent to institution code 5859. PLEASE do NOT enter a department code.). A completed application consists of the on-line application form, uploaded official up-to-date transcripts of all undergraduate and graduate work from institutions from which you received a degree, ETS scores, three letters of recommendation, and a $65 non-refundable application fee.

Uploading a transcript

While completing your online application and prior to submitting it, you will be required to upload one copy of your scanned official transcript from each institution from which you have earned or will earn an undergraduate or graduate degree. Do not send transcripts for community college attendance or from any institution where you enrolled in classes but did not earn a degree.

Please do NOT mail your official transcripts to us until you have received an offer of admission from Virginia Tech. **Make sure your scanned documents are legible BEFORE uploading. Non-legible documents will not be accepted.**

You may scan a copy of your official paper or electronic transcript provided to you from your institution's Registrar. Do **NOT** upload your institution's web-based academic record or a document stating it is not an official transcript. Make sure that **all** critical and identifying marks have been scanned and are legible. These include the institution's name, your name, the names of your courses and the grades you have received. It is important that you scan both the front and back of your transcript as we will need to be able to review the information provided on the back of your transcript concerning credit hours, the institution's grading scale, etc. Please ensure that your file is in Word (.doc) or PDF format.

If you encounter issues with uploading your transcripts in your online application please contact help@applyweb.com.

The process of uploading transcripts is intended to eliminate the need for you to mail in your transcripts, as our departments will be able to review your application based on your uploaded transcripts. If you are offered admission, you will be required to provide an official copy of your transcript(s) upon the awarding of your degree and its posting to your transcript prior to your enrollment at Virginia Tech.

The official transcripts showing degree conferral should be sent directly from your institution(s) to:
Virginia Tech Graduate Admissions
120 Graduate Life Center at Donaldson Brown
Mail Code 0323
Blacksburg, Virginia 24061

Virginia Tech reserves the right to rescind any offer of admission if any discrepancies are found between your uploaded and official transcript(s).

Virginia Tech does not discriminate against employees, students, or applicants on the basis of race, color, sex, sexual orientation, disability, age, veteran status, national origin, religion, or political affiliation. The university is subject to title VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Age Discrimination in Employment Act, the Vietnam Era Veteran Readjustment Assistance Act of 1974, Federal Executive Order 11246, Governor Allen's State Executive Order Number Two, and all other rules and regulations that are applicable. Anyone with questions concerning any of these regulations should contact the Equal Opportunity/Affirmative Action office.

Virginia Tech's Title IX coordinator is Pamela White. (Contact at pdwhite@vt.edu; 540-231-8771)

Personnel

Faculty

L. Anderson	Oxford University, 2008.	Theory, particle and fields.
N. Arav	Colorado, Boulder, 1994.	Astrophysics
E. Barnes		Theory, condensed matter
L. N. Chang	UC Berkeley, 1967.	Theory, particle and fields.
S. Cheng	Johns Hopkins, 2010.	Experiment, condensed matter.
D. Farrah	Imperial College London, 2002.	Astrophysics.
S. Economou		Theory, condensed matter
J. Gray	University of Sussex, 2001.	Theory, particle and physics.
J. R. Heflin	Pennsylvania, 1990.	Experiment, condensed matter, biophysics.
J. J. Heremans	Princeton U, 1994.	Experiment, condensed matter.
P. Huber	TU Munich, 2003.	Theory, particle and fields.
G. A. Khodaparast	Oklahoma , 2001.	Experiment, condensed matter, biophysics.
J. M. Link	UC, Davis, 2001.	Experiment, nuclear and particle physics.
C. Mariani	University of Rome, 2008.	Experiment, nuclear and particle physics.
W. Mather	Georgia Tech, 2007.	Biophysics.
D. Minic	Texas Austin, 1993.	Theory, particle and fields.
P. R. Montague	Alabama, 1988.	Neuroscience and medical physics, biophysics.
S. K Mun	SUNY, Albany, 1979.	Neuroscience and medical physics.
V. Nguyen	Amsterdam, 2004.	Experiment, condensed matter.
A. Özcan	Washington U, St. Louis.	Neuroscience and medical physics.
K. Park	Princeton, 2000 .	Theory, condensed matter.
S. Petty	Catholic University of America	Astrophysics
L. E. Piilonen	Princeton, 1985 .	Experiment, nuclear and particle physics.
M. L. Pitt	Princeton, 1992.	Experiment, nuclear and particle physics.
M. J. F. Pleimling	U Saarland, 1996.	Theory, condensed matter.
H. D. Robinson	Boston, 2000.	Experiment, condensed matter.
V. W. Scarola	Pennsylvania State, 2002.	Theory, condensed matter.
B. Schmittmann	U Edinburgh, 1984.	Theory, condensed matter.
E. R. Sharpe	Princeton, 1998	Theory, particles and fields.
J. H. Simonetti	Cornell, 1985	Astrophysics.
V. Soghomonian	Syracuse, 1995.	Experiment, condensed matter.
T. Takeuchi	Yale, 1989.	Theory, particles and fields.
C. Tao	Maryland, 2007 .	Experiment, condensed matter.
U. C. Täuber	TU Munich, 1992.	Theory, condensed matter.
R. B. Vogelaar	Caltech, 1989.	Experiment, nuclear and particle physics.
Wong, Kenneth	UC Berkeley/San Francisco, 2002.	Neuroscience and medical physics.

Administration

John S. Simonetti	Associate Chair
Jackie Woodyard	Business Manager
Betty J. Wilkins	Graduate Student Services
Eric R. Sharpe	Graduate Committee Chair
Jean J. Heremans	Undergraduate Committee Chair

Diane Walker-Green	Undergraduate Student Services

Emeriti

M. Blecher	(Particle Physics, experimental)
R. L. Bowden	(Physics Teaching)
J. J. Broderick	(Astrophysics, observational)
B.K. Dennison	(Astrophysics)
B. R. Ficenec	(Nuclear Physics, experimental)
K. Gotow	(High Energy, experimental)*
G. J. Indebetouw	(Optics/Condensed Matter, experimental)
D. A. Jenkins	(Nuclear Physics, experimental)**
J. R. Long	(Condensed Matter, experimental)
T. Mizutani	(Particle Physics, theory)
L. W. Mo	(Particle Physics, experimental)***
A. L. Ritter	(Condensed Matter, experimental)
L. D. Roper	(Nuclear Physics, theory)
J. Slawny	(Mathematical Physics)
W. P. Trower	(Particle Physics, experimental)
H. C. Tze	(Particle Physics, theory)
C. D. Williams	(Condensed Matter, theory)
R. Zallen	(Condensed Matter, experimental)
R. K. P. Zia	(Condensed Matter, theory)
P. F. Zweifel	(Mathematical Physics)

* Member of the BELLE collaboration at KEK
**Member of the CLAS collaboration at JLAB
***Member of the ORLaND collaboration at ORNL, and LHC, CERN.

Examples

PROPOSED GRADUATE PROGRAM OF

(Name of Student)
Leading to the Degree of
Master of Science in Physics

Dept. and Course No.	Course Title	Semester/Year Planned	Total Credits
5000 and Higher Level Courses			
PHYS 5354	Classical Mechanics	Term	3.0
PHYS 5405	Classical Electromagnetism-I	Term	3.0
PHYS 5406	Classical Electromagnetism-II	Term	3.0
PHYS 5455	Quantum Mechanics-I	Term	3.0
PHYS 5456	Quantum Mechanics - II	Term	3.0
PHYS 5714	Methods of Theoretical Physics	Term	3.0
PHYS 5705	Statistical Mechanics	Term	3.0
PHYS 5944	First-Year Seminar (Part 1)	Term	1.0
PHYS 5944	First-Year Seminar (Part 2)	Term	1.0
	Electives		9.0
	Independent Study (max)		6.0
	Total 5000 and Higher Level Courses		32
	Total Graduate Hours		32

Signature of Student's Advisory Committee and Department Chair

_____
Full Name Committee Chair

_____
Full Name Department Chair

_____
Full Name Committee Member

_____
Full Name (Student's)

_____
Full Name Committee Member

_____
Address

_____
Student ID #

PROPOSED GRADUATE PROGRAM OF

Leading to the Degree of
Doctor of Philosophy in Physics

Dept. and Course No.	Course Title	Semester/Year Planned	Total Credits
PHYS 7994	Research and Dissertation	F2011	60.00
	Total Hours Research and Dissertation		**60.00**

5000 and Higher Level Courses

PHYS 5354	Classical Mechanics	3.0
PHYS 5405	Classical Electromagnetism-I	3.0
PHYS 5406	Classical Electromagnetism-II	3.0
PHYS 5455	Quantum Mechanics-I	3.0
PHYS 5456	Quantum Mechanics - II	3.0
PHYS 5714	Methods of Theoretical Physics	3.0
PHYS 5705	Statistical Mechanics	3.0
PHYS 5944	First-Year Seminar (Part 1)	1.0
PHYS 5944	First-Year Seminar (Part 2)	1.0
	Electives	9.0
	Independent Study (max)	6.0
	Total 5000 and Higher Level Courses	32
	Total Graduate Hours	92

Signature of Student's Advisory Committee and Department Chair

Print Name Committee Chair	Print Name Department Chair
Print Name Committee Member	Print Name (Student's)
Print Name Committee Member	Address
Print Name Committee Member	Student ID #