

A guide to M.S. and Ph.D. Requirements in the Department of Physics and Astronomy

Fall 2001



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The University of Tennessee
Department of Physics & Astronomy

Graduate Student Manual
Fall 2001

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INTRODUCTION

This handbook is designed to guide graduate students through degree requirements, student responsibilities and research and teaching opportunities in the Department of Physics and Astronomy. Although general descriptions of both University and departmental requirements are provided, UT's *Graduate Catalog* (<http://web.utk.edu/~gsinfo/toc.htm>) overrides any information in this handbook and serves as the last word for official University policies regarding graduate study. All graduate students are advised to periodically review the M.S. and Ph.D. degree guidelines as set forth in the catalog to keep up with the most recent requirements. *Graduate School News* (<http://web.utk.edu/~gsinfo/gsn.htm>), published each semester by the Graduate School, is another good resource for students to keep abreast of specific deadlines and changes in University policy. Students are notified of any changes in departmental requirements by internal memoranda and announcements.

The physics department strives to provide a positive learning and research environment to foster students' professional development. The graduate student advisor works with each student to plan a successful graduate curriculum encompassing learning, research, and teaching opportunities. Ultimately, the individual student is responsible for his or her own graduate program.

GENERAL INFORMATION AND REQUIREMENTS

The physics department offers a rewarding intellectual program as well as a congenial environment for the development of professional and personal relationships. To help graduate students realize their potential, the department has established certain general requirements to set them on the best course of study and incorporate them into the physics community.

Graduate Placement Examination

A graduate placement examination is required of all first-year graduate students. This exam is given each year in August, just prior to the fall semester. This exam gives students and faculty a clear idea of students' aptitude and accomplishments in physics as they begin graduate work. The exam is given in a two-hour session and covers (1) classical mechanics, (2) electricity and magnetism, (3) thermodynamics, (4) optics, and (5) modern physics. The exam material is of a level similar to that of advanced undergraduate courses on these subjects at most schools. The scores on each of the five subjects are tabulated separately. Exam results go to the student's advisor, who will discuss them with the student. Students are expected to consult their advisors about their individual progress and future studies.

Graduate Advising

Dr. Ken Read is the designated academic advisor for all first year graduate students. Each student should consult with Dr. Read before registering for courses in the fall and spring

semesters of the first year of graduate study. Dr. Read remains the student's advisor until he or she joins a research group and becomes an advisee of a faculty member in that area. The student must inform the graduate secretary, Ms. Robbyn Collins, of the change in advisor status.

Fields of Study

The physics department offers several opportunities for graduate students to pursue specific scientific interests. Graduate students may emphasize study in the following fields:

- Astrophysics
- Atomic and Low-Temperature Physics
- Biophysics
- Chemical Physics
- Condensed Matter and Surface Physics
- Elementary Particle Physics
- Geophysics (M.S. only)
- Health Physics (M.S. only)
- Mathematical and Computational Physics
- Molecular Spectroscopy
- Nuclear Physics
- Theoretical Physics

Students are encouraged to contact faculty members working in areas of interest to them to learn more about opportunities in specific fields. Departmental graduate programs leading to the M.S. and Ph.D. are also available at The University of Tennessee Space Institute at Tullahoma. Students interested in these programs should contact the UTSI Dean for Academic Affairs. More information is available from the Space Institute's Office of Graduate Admissions (phone: 1-888-822-UTSI or e-mail: admit@utsi.edu.) The UTSI Web site is: <http://www.utsi.edu/>.

The Physics Community at UT

Graduate students are an important part of the physics department's social and professional structure. The department sponsors a chapter of the Society of Physics Students to increase interaction between students and faculty members in a less formal manner than lectures and laboratories. Although SPS is primarily an undergraduate organization at Tennessee, graduate students are encouraged to participate in SPS-sponsored activities (such as Friday morning coffee and doughnuts). Within SPS, the department sponsors a chapter of Sigma Pi Sigma, the physics honor society (see the Assistantships and Departmental Honors section). A graduate student liaison committee meets periodically with the department head to discuss issues relating to graduate requirements, responsibilities, etc. Graduate students are also invited to participate in various departmental affairs, including the annual spring picnic and guest lectures.

Colloquium

The physics department holds a weekly colloquium to spark the exchange of ideas and encourage interaction among scientific colleagues. **Graduate students are expected to attend the colloquia** as a means of learning about future directions in physics research and developing relationships with faculty members and other students. The colloquium is traditionally held on a weekday afternoon, with the speaker list, time, and date circulated in advance.

Physics Career Resources

Several resources are available to help physics students explore career options upon completion of their degrees. There are a number of Internet sites that provide useful information about available positions, career planning, and employment statistics. The following are some good starting places and are listed on the physics Web site career opportunities page (<http://www.phys.utk.edu/jobs.htm>):

- American Physical Society Career Page (<http://www.aps.org/jobs/>)
- The Science Job Market (<http://www.psrc-online.org/careers/act.html>)
- American Institute of Physics Career Services (<http://www.aip.org/careersvc>)
- University of Tennessee Career Services (<http://career.utk.edu>)

General Administrative Items

The physics office resources are available to all graduate students to aid in the administrative aspects of their program. The copier and fax machine in the main office are open to student use with instruction from the office staff (e.g., use of copier codes, etc.). Information on e-mail accounts and other technology resources is available online at <http://www.utk.edu/technology/>. The department also has a mechanical shop for students, who must first consult with the Dr. Jim Parks for initial orientation and approval for shop use.

Leaving the Program

If, for any reason, a graduate student terminates study in the physics department, he or she must see the office supervisor, Ms. Pam Carter, to follow proper checkout procedures. Failure to comply with this policy will result in a hold on any outstanding paychecks issued to the student, as well as a hold on academic transcripts from the University.

Disability Statement

If you need course adaptations or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at 191 Hoskins Library at 974-6087. This will ensure that you are properly registered for services.

POINTS OF CONTACT

<u>Name</u>	<u>Office/Phone/E-Mail</u>	<u>Responsibility</u>
Dr. Soren Sorensen Department Head	soren-sorensen@utk.edu 974-3342 401 Nielsen Physics	Meets with graduate student liaison committee
Dr. Jim Parks Associate Head and Director of Undergraduate Labs	jeparks@utk.edu 974-8952 404 Nielsen Physics	Makes teaching assistant assignments, handles student machine shop orientation
Dr. Ken Read Associate Professor	kfread@utk.edu 974-9020 212 Science and Engineering Building	Serves as department's graduate student advisor
Ms. Pam Carter Office Supervisor	pcarter@utk.edu 974-3342 401 Nielsen Physics	Handles keys, copier codes, and employment paperwork
Ms. Robbyn Collins Graduate Secretary	rcollin8@utk.edu 974-3342 401 Nielsen Physics	Notify of changes in advising status, notification of graduation, etc.
Ms. Heather Doncaster Thesis/Dissertation Consultant	thesis@utk.edu 974-1337 218 Student Services Building http://web.utk.edu/~thesis	Advises students on University requirements for thesis or dissertation preparation
The Graduate School	gsinfo@utk.edu 974-3251 218 Student Services Building http://web.utk.edu/~gsinfo	Graduate catalogs, deadlines, admission to candidacy, etc.

GENERAL ADMISSION REQUIREMENTS

A student who enrolls in The Graduate School with the intention of attaining an advanced degree in physics will have completed an undergraduate major in physics or its equivalent. Physics 311-12, 321, 361, 431-32, 421, 461, and 411-12 constitute the minimum courses prerequisite to graduate study. A student who intends to present physics as a graduate minor will have completed an undergraduate minor in physics or its equivalent. Physics 311 and 431-32 constitute the minimum coursework prerequisite to a minor in physics.

REQUIREMENTS FOR THE M.S. IN PHYSICS

The physics department has outlined three programs to complete the M.S. degree: a thesis option, a project option, and a non-thesis option. Candidates for the M.S. degree may not at the same time be candidates for a Ph.D. degree.

Requirements for the Thesis M.S. Program

This program is designed primarily for students who intend to go into industrial or governmental laboratories as physicists. The requirements are as follows:

- 12 semester hours selected from the following core courses:
 - Physics 511-512: Theoretical Physics
 - Physics 521-522: Quantum Mechanics
 - Physics 531-532: Classical Mechanics/Advanced Classical Mechanics
 - Physics 541-542: Electromagnetic Theory
 - Physics 571-572: Mathematical Methods in Physics (*may be counted toward minor, if not used to meet core requirements*)
- 12 semester hours of additional courses
- Six hours of thesis research (Physics 500)
- Seminar
- Presentation of an acceptable thesis
- Oral examination on course material and thesis research

The department offers an M.S. thesis program with a concentration in geophysics. Program requirements are: 12 hours from Physics 531-32, 541-42, 571-72; a minimum of 12 additional hours in geology, geophysics, and/or physics, as approved by the student's committee; and the presentation of an acceptable thesis, 6 hours of Physics 500, and the passing of an oral examination on course material and thesis.

The University requirements for the thesis M.S. program are as follows: a student presenting a master's thesis shall register for at least six semester hours of Physics 500

(Thesis Registration). See page 21 of the *Graduate Catalog* for course requirements regarding Physics 500. If a student does not complete the thesis during the semester in which he or she originally registers for the last three hours of 500, the student should continue to register for a minimum of three hours of 500 for each semester he or she is actually working on the thesis through the semester in which the thesis is accepted by the Graduate School. Fees shall be paid in accordance with regular University policy.

Before registering for Physics 500, each student must decide with whom he or she wishes to work and discuss research possibilities with that professor. Students should notify the graduate secretary of their respective thesis directors before registering for Physics 500. The student and his or her research director will then choose the student's committee. Most students will require from two to three years to complete the thesis option for a master's degree in physics. The University's thesis/dissertation consultant, Heather Doncaster, is available to help students meet UT thesis requirements (see points of contact list).

Requirements for the Project (in lieu of thesis) M.S. Program:

- 9 semester hours from the core courses:
 - Physics 506: Experimental Physics
 - Physics 511-512: Theoretical Physics

- 6 semester hours from the courses:
 - Physics 593: Independent Study
 - Physics 594: Special Problemsfor a comprehensive project with the supervision of a major advisor.

- 9 semester hours from the general physics courses:
 - Physics 411-412: Introduction to Quantum Mechanics
 - Physics 421: Modern Optics
 - Physics 431-432: Electricity and Magnetism
 - Physics 461-462: Modern Physics Laboratory
 - Physics 507: Contemporary Optics
 - Physics 508: Laser Physics
 - Physics 521-522: Quantum Mechanics
 - Physics 531-532: Classical Mechanics/Advanced Classical Mechanics
 - Physics 541-542: Electromagnetic Theory
 - Physics 555: Solid State Physics
 - Physics 571-572: Mathematical Methods in Physics
 - (at least 3 hours above the 500 level)

- 6 semester hours from a minor single field outside of the physics department. Suggestions include areas such as computer sciences, mathematics, engineering, chemistry, biology, education, business, and law.

The project in lieu of thesis represents the culmination of an original research project completed by the student. A candidate must pass a final oral examination measuring the candidate's ability to integrate material in the major areas related to the M.S. degree in Applied Physics including the work presented in the project. A written report must be approved and accepted by the Graduate Committee, the Graduate Committee chairperson and the department head. An electronic version of the written report must also be submitted to the permanent electronic archive of the physics department available to the Internet.

Most students may complete this project-in-lieu thesis option in two or less years. Maximum flexibility shall be provided to accommodate part-time students seeking the M.S. degree for career enhancement.

Requirements for the Non-Thesis M.S. Program

This program is designed primarily for students who intend to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students who choose the non-thesis master's program must apply to the department's graduate committee for permission to enroll. The degree requirements are:

- 18 semester hours selected from the following core courses:
 - Physics 511-512: Theoretical Physics
 - Physics 521-522: Quantum Mechanics
 - Physics 531-532: Classical Mechanics/Advanced Classical Mechanics
 - Physics 541-542: Electromagnetic Theory
 - Physics 571-572: Mathematical Methods in Physics (*may be counted toward minor, if not used to meet core requirements*)
- Six semester hours in a minor field
- Six semester hours from additional courses numbered 400 or above
- Seminar
- Written exam

A student who wishes to follow the non-thesis program must submit a written request to the chair of the departmental graduate studies committee (Dr. Ken Read). In this request, the student should list courses taken, grades received, and further courses he or she plans to take. If the request is granted, the chair of the graduate studies committee will notify the student and will also appoint a faculty member who will act as the chair of the student's committee. Students who complete this option must take at least 20 hours at the 500 level or above. The non-thesis master's degree takes approximately two years to complete.

Policies & Procedures for M.S. Students

1. Committees: The M.S. committee comprises at least three persons with the rank of assistant professor or above, usually with the research director as chair. In the case of a master's committee, the members will normally all be from the physics department, if there is no minor. If the student has a minor, one member of the committee must be from the minor department. All members must hold an official appointment with the University. The student should check with his or her professor to decide upon the committee and see that the appointments are made. Once the committee has been chosen, the student must file an application for admission to candidacy. The official request for approval by the Graduate School is not necessary for formation of M.S. committees; however, signatures on applications for candidacy are required.
2. Admission to Candidacy: The prospective M.S. candidate must fill out an application for admission to candidacy (<http://web.utk.edu/~gsinfo/acforms.htm>). The application should list all courses taken in graduate school and those proposed to be completed by the time the degree is finished. This application may be submitted after admission to the Graduate School and after approximately nine semester hours of graduate credit courses have been completed. A student must have a 3.0 average or higher (no incompletes) in all courses taken for graduate credit before applying for candidacy. Courses may not be repeated to raise the grade. An overall 3.0 average must be maintained for graduation. Before submitting the application, the student must choose a thesis director (the person with whom he or she will perform research) and should consult with that professor concerning the appointment of a committee of three persons, all of whom sign the application. **The application must be submitted to the Office of Graduate Admissions and Records no later than commencement day of the semester preceding the semester in which the student plans to graduate.**
3. Thesis (if applicable): A draft of the thesis in a form approved by the student's major professor should be submitted to all committee members at least two weeks before the date of the final oral examination. The exam must be scheduled with the Office of Graduate Admissions and Records at least one week prior to the exam. The Graduate School supplies information as to the format of theses and deadline dates for these examinations each semester. The official manual used in thesis writing is the *UT Knoxville Guide to the Preparation of Theses and Dissertations* (online version: <http://web.utk.edu/~thesis/guide.htm>) and it should be followed closely with some exceptions (see Appendix). Two copies of the thesis must be submitted to and approved by the Graduate School on or before the specified dates (see the *Graduate School News* for deadlines). Each copy of the thesis must include an approval sheet, signed by the members of the committee, which certifies to the Associate Vice Chancellor and Dean of the Graduate School that the committee has examined the final typed copy of the thesis and found its contents to be satisfactory. In addition to the two Graduate School copies of the thesis, the student is required to give the physics department one unbound copy, including a copy of the approval sheet, for the departmental file.

4. Graduation: Students who expect to complete degrees should inform the physics department graduate secretary at the beginning of the final semester so that accurate lists can be submitted to the Office of Graduate Admissions and Records. Graduating students should also place their names on the graduation list and apply for their diplomas at the beginning of their final term.

REQUIREMENTS FOR THE PH.D. IN PHYSICS

The department offers an excellent learning and research environment for doctoral study in physics. The program for doctoral candidates is as follows:

- On arrival:
 - Take the graduate placement exam on undergraduate physics
(for advising purposes only-see page 1).
 - Meet with the graduate advisor to plan an individual program of study.
- First two years of the graduate program:
 - Take nine semester hours (three courses) each semester, in addition to any research or teaching assistantships. The nine hours are selected from the following core courses, which are the usual basis for the departmental Ph.D. qualifying exam. A typical 9-hour load consists of two or more core courses (6 hours) and one elective course (3 hours).

Physics 521-522: Quantum Mechanics

Physics 531-532: Classical Mechanics/Advanced Classical Mechanics

Physics 541-542: Electromagnetic Theory

Physics 571-572: Mathematical Methods in Physics

- Take and pass Ph.D. qualifying exam (must be completed within 2-3 years). Students are normally required to take the qualifying exam after two years of physics study.
- Other courses required for the Ph.D. are:
 - Physics 551 - Statistical Mechanics
 - Physics 611 - Advanced Quantum Mechanics and Quantum Field Theory
 - Physics 6xx-6yy - One-Year Specialty - Ph.D. level (see #1 under Policies and Procedures for Ph.D. Students, below.)
- A candidate for a doctoral degree must complete a minimum of 24 hours of graduate coursework beyond the master's degree or 48 hours of coursework beyond the bachelor's degree, excluding the credit for Physics 600 (Doctoral Research and Dissertation). A minimum of six semester hours of the student's coursework must

be taken at the 600 level, **exclusive of dissertation**. In addition, 24 hours of course 600 are required. No student is eligible to take credit for Physics 600 until he or she has (1) passed the Ph.D. qualifying exams and (2) made an agreement with a research advisor. Note: Once registration for course 600 has begun, the Ph.D. student **must** register for at least three hours of 600 **every semester** until the dissertation is accepted, according to the rules of the Graduate School. It is the policy of the physics department that this be nine hours during the fall and spring terms, and six in the summer, if there are no courses being taken.

Policies and Procedures for Ph.D. Students

1. Exceptions to Course Requirements: The student's doctoral committee must approve exceptions to course requirements. Physics 601-02 are normally required of students specializing in atomic physics; Physics 621-22 of students specializing in nuclear physics; Physics 626-27 of students specializing in elementary particle physics (and/or Physics 613-614 for students specializing in theoretical high energy physics); Physics 671-72 of students specializing in condensed matter and surface physics, and Physics 681-682 for students specializing in molecular spectroscopy. Students specializing in chemical physics may substitute Chemistry 572 for Physics 551 and should complete at least six semester hours from Chemistry 580, 670. Exceptions to any of the above course requirements are to be brought to the attention of the major professor by the student. The major professor is then expected to inform the graduate studies committee and obtain approval for such exceptions. A student's intended date of graduation may be greatly delayed by failure to comply with this rule.
2. Qualifying Examination: The qualifying examination topics are announced three months in advance. The examinations are usually given on a Friday, Wednesday, and Monday at the beginning of August to allow time for grading and a faculty vote before registration. Students who wish to register for the exams must submit a written application to the department head no later than one month following the announcement of the examinations.

All students in the Ph.D. program must take the qualifying examination (three tests). It is not necessary for all three tests to be taken at the same time initially. However, all full-time students in the Ph.D. program must have taken all three tests by the end of their second academic year in the Ph.D. program. Limits on the tests are as follows: any failed test not yet passed must be taken each year thereafter until passed. Students may fail at most five individual qualifying tests. All tests must be passed within three consecutive administrations of the qualifying examination. In November 2000 the faculty voted to make a modest relaxation of one of the rules concerning how many qualifying tests must be taken on one's first attempt in certain cases. Please, however, note the following cautions:

- This change has no effect on students who will already be at the end of their second academic year or beyond as of summer 2001.
- Note that taking one or more of the exams before the beginning or just after the end of the first academic year starts the clock earlier concerning a maximum participation of three consecutive administrations. As this may not be a good strategy for everyone, students should discuss such matters with their advisor(s).
- This rule change does not mean that the department encourages or recommends that students attempt the qualifier exams earlier than required, or that there is no benefit in "simultaneous mastery" of the material. It is simply now that the above is permitted.

In assessing the Ph.D. qualifying examinations, the department normally takes into account the student's entire academic record with particular reference to (1) the grade average in graduate courses and (2) demonstration of aptitude for research, as well as the performance on the qualifying examinations. The doctoral program must be completed within five years after passage of the Ph.D. qualifying examinations.

3. Committees and Major Advisor: Students may find a research advisor before, or at the latest, soon after, passing the Ph.D. qualifying exam. This major professor, with the student's help, will select a doctoral committee and will act as chair of the committee. The department must approve this committee. The doctoral committee is composed of at least four members, with at least three members from the physics department and one member from outside the department. Of the four committee members, at least three must be approved to direct doctoral research; the student's chair must be so approved. All members must hold official appointments with the University and be actively engaged in research. A courtesy appointment may be requested from the Dean of the Graduate School for those members not having an official appointment.

Occasionally students want to work on research at Oak Ridge National Laboratory with an ORNL scientist as the primary advisor. If that Oak Ridger has faculty status in the physics department and is approved by the UT Graduate School to direct doctoral research, then that person can serve as the official chair of the student's doctoral committee. If the proposed research director does not have such official UT status, then a member of the physics department must act as the committee chair while the research is directed by the ORNL scientist. When the doctoral committee has been chosen, the department must officially notify the Graduate School. The physics office has a form that officially requests the appointment of the committee. The proposed committee members must sign the application for candidacy form, and then the Graduate School makes the official committee appointment.

The department requires that a candidate's committee meet with him or her at least twice per academic year. One such meeting per year should be without the presence of

the committee chair. This committee is set up to help the student, who is urged to consult its members when technical, procedural, or other problems arise, and to keep them informed of his or her progress.

4. Admission to Candidacy: After the student has chosen a major advisor and selected a doctoral committee, he or she must file an application for admission to candidacy (<http://web.utk.edu/~gsinfo/acforms.htm>). The research director and all members of the committee must sign this application. The prospective candidate must list all courses taken in graduate school as well as all courses proposed by the completion of the degree. If the candidate has a M.S. degree, the courses taken for that degree should be listed. Exceptions to any of the above course requirements are to be brought to the attention of the major professor by the student. The major professor is then expected to inform the Graduate Studies Committee and obtain approval for such exceptions. **A student's intended date of graduation may be greatly delayed by failure to comply with this rule. The Graduate School requires that Ph.D. students become candidates at least one full semester before the expected date of graduation. Adherence to this one semester rule for candidacy is strict; application must be made by or before the middle of a semester for that semester to count.**

5. Doctoral Research: Students who wish to register for Physics 600 (Doctoral Research and Dissertation) are requested to notify the departmental graduate secretary of the name of their research director. The registrar requires a progress report each term and this professor must sign the report sheet. No student may receive credit for Physics 600 until he or she has passed the Ph.D. qualifying examination and has been accepted by a faculty research advisor for research toward the Ph.D. The student must register continuously for course 600 (minimum of 3 hours) from the time the doctoral research proposal is approved, admission to candidacy is accepted, or registration for course 600 is begun, whichever comes first, including summer semester and the semester in which the dissertation is approved and accepted by The Graduate School. A minimum total of 24 hours of course 600 is required before the dissertation will be accepted. A student who will not be using faculty services and/or university facilities for a period of time may request leaves of absence from dissertation research up to a maximum of six terms (including summer terms). The request, to be made in advance, will be considered by The Graduate School upon written recommendation of the department head.

Doctoral candidates have the opportunity to choose a dissertation topic supported by research facilities at the UT laboratories in Knoxville; The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory; or other facilities used by UT faculty. The dissertation is expected to be of a quality, magnitude and scope comparable to the articles published in the research journals of the American Institute of Physics and should have been submitted to one of these at the time of the oral examination. The committee may withhold approval of the dissertation until notification of acceptance for publication is obtained.

6. Submission of Dissertation: Upon completion of doctoral dissertation research, a candidate will submit a draft of his or her dissertation to the committee chair. The department recommends that this draft be available to the professor in charge six weeks before the expected date of graduation. The committee chair will then set a date for the final oral examination. (This examination must be held no later than one week before the final date for submission of the dissertation to the Graduate School.) The committee chair must notify the Office of Graduate Admissions and Records of this date. The Graduate School will then officially notify the rest of the committee members. A physics department regulation specifies that draft copies of the dissertation be made available to the entire committee at least three weeks prior to the date of examination. The Graduate School requires that the dissertation in final form must be distributed to all committee members two weeks before the examination. These rulings were made to ensure that the committee members have adequate time to read the dissertation carefully. Should any changes be necessary as revealed at the examination, there will thus be time for their incorporation in the dissertation before the date on which it is due in the Office of Graduate Admissions and Records.
7. Final Examination: The final oral examination, according to a ruling of the Graduate School, must be held in Knoxville (exceptions are made for UTSI students). This rule allows these examinations to be open to all members of the faculty. This final examination may cover the student's dissertation, special field, and other fields as the student's faculty committee may specify. The physics department policy states that Ph.D. students will not be passed on their final oral examination unless and until a paper based on the dissertation research has been submitted to a research journal of the American Institute of Physics (or other journal approved by the graduate studies committee) and the referee's report of the paper is in the hands of the student's committee. In unusual circumstances – with the unanimous agreement of the student's committee – this rule may be waived.
8. Graduation: Students who expect to graduate at the end of a given semester should notify the departmental graduate secretary during the first two weeks of the semester. The secretary will then be able to forward the proper notice to the Graduate School office.

ASSISTANTSHIPS AND DEPARTMENTAL HONORS

The Department of Physics and Astronomy offers graduate students the opportunity to gain valuable experience while offsetting tuition costs with teaching and research assistantships. Teaching and research assistants are appointed for 12-month periods with the authorized stipends paid in 12 equal checks and the remission of fees for the semesters covered by the period of appointment. University policy dictates that the waiver of fees for assistantships applies to maintenance and tuition fees only; it does not include the program

and services fee, facilities fee, or the technology fee. For graduate research assistants, the maintenance fee is paid by the granting agency and is in addition to the stipend paid. Both teaching and research assistants are expected to register as full-time students (nine hours of graduate coursework during the fall and spring terms and six hours in the summer). Students who do not intend to take this defined full load in classroom credit have the following options:

- If working on research for a Master's degree, take Physics 500 (Thesis).
- If working on research for a Ph.D., take Physics 600 (Doctoral Research and Dissertation). Note: once registration for 600 has begun, the student must register for at least three hours of 600 every semester until the dissertation is accepted, according to the rules of the Graduate School.
- If the student is doing research that is not expected to be applied to a thesis or dissertation, the appropriate course number is Physics 501 (Graduate Research Participation).
- If none of the above applies, all full-time graduate students must still register for nine or more hours during the fall and spring terms and six hours in the summer. Besides regular coursework, options include Physics 593 (Independent Study) and 502 (Registration for Use of Facilities).

Students should consult the *Graduate Catalog* for a more thorough discussion of graduate assistantship rights and responsibilities, evaluation, etc.

The assistantship and graduate course work constitute a full-time load. Students may not hold outside employment during the academic year. Violation of this statute will result in termination of the assistantship. Students under severe financial stress should consult with their advisors.

Graduate Teaching Assistants

GTA's are normally expected to teach either laboratory or recitation sections in general physics and/or grade to the extent of half-time or six credit hours per week for two semesters. Teaching assistants who wish to work during the summer term must apply to the Director of Undergraduate Laboratories. Summer appointments are not guaranteed, although priority is given to students who are enrolled in summer courses and who have demonstrated excellence in teaching ability.

Graduate Research Assistants

GRAs work different hours depending on the percent of full-time appointment made. Usually the decision concerning the percent full-time is reached by mutual agreement between the student and the research group leader. For example, an appointment of 50% full-time requires working 20 hours per week, whereas a 75% appointment requires 30 hours per week. Generally, appointments over 50% full-time are not made until the student has completed general coursework and is concentrating on dissertation or thesis

research. Students at the University on F1 or J1 visas must follow work hour limits of Immigration and Naturalization Services.

Further funding information for graduate students is available from *GradSources*, a publication of the Graduate School. *GradSources* is available online at <http://web.utk.edu/~gsinfo/fact.htm>.

Departmental Honors

Graduate students are eligible for a number of honors in the physics department. Traditionally, announcement of these awards is made at the department's honors day ceremonies each spring. The UT chapter of the Society of Physics Students screens all physics students for initiation into Sigma Pi Sigma, the physics honor society. Any interested graduate students must have met Sigma Pi Sigma requirements at their respective undergraduate institutions, or must satisfy the following prerequisites:

- Must have completed one full year of graduate study in physics with 6 graduate level courses in physics completed. Seminar, thesis, and independent study courses are excluded from the 6 hours.
- Must have a minimum GPA of 3.5 for all physics courses
- Must have a minimum GPA of 3.25 for all graduate courses

Faculty members nominate and vote for graduate students to receive other departmental awards. These include:

The Paul H. Stelson Fellowship in Physics: a \$2,500 fellowship established by the Stelson family to assist aspiring physicists and continue the strong physics research tradition between UT and Oak Ridge National Laboratory.

The Joe Fowler and Jerry Marion Outstanding Graduate Student Award: a \$1,000 award recognizing outstanding achievement by a graduate student.

Outstanding Graduate Teaching Assistant Award: a \$500 award given to the GTA with the best record of teaching, as indicated by student evaluations.

Graduate students who make exceptional contributions to the undergraduate physics laboratories are also recognized.

APPENDICES

- Sample Syllabus for Qualifying Examination
- Registration Form for Thesis/Dissertation Hours
- Thesis/Dissertation Information

Registration Form for Thesis/Dissertation Hours

The Department of Physics and Astronomy
The University of Tennessee, Knoxville

DATE: _____ SEMESTER: _____

COURSE: _____

INSTRUCTOR WHO WILL ASSIGN GRADE: _____

STUDENT: _____

(Please return this form to Room 401, Physics Building before the drop/add deadline of each semester).

Students registering for Physics 490, 500-502, 591-594, and 600 have the responsibility for filling out this form and returning it to the graduate secretary, Room 401, Nielsen Physics Building, before the drop/add deadline of each semester. Students who register for the above courses but fail to fill this form out before the deadline are subject to being given a grade of "W" or "NP."

Thesis/Dissertation Information

Each semester, the Graduate School holds a thesis/dissertation workshop. Instructions are given and questions are answered about the mechanics of thesis/dissertation writing. All graduate students are encouraged to attend. The official manual used in thesis/dissertation writing is the *UT Knoxville Guide to the Preparation of Theses and Dissertations* (online version: <http://web.utk.edu/~thesis/guide.htm>). These guidelines should be followed with some exceptions. For example, an alternate method permitted physics students is to assemble references used in the bibliography at the end of the thesis or dissertation, in a numerical list in the order in which they appear in the text. The format used for these entries is that given by articles from the *Physical Review*. This method is recommended for physics students for the purpose of acquainting them with the standard literature and as a guide in the preparation of their requirement for publication.

In the body of the thesis, references are denoted by a numerical superscript (¹). In the references the article may be referred to (for example) by:

1. Paul G. Huray, Louis D. Roberts, and J. O. Thomson, Phys. Rev. B4, 2147 (1971).