UNIVERSITY OF MINNESOTA DULUTH

DEPARTMENT OF PHYSICS

Physics Graduate Student Handbook

Welcome to the UMD Physics Department! The Department's Master of Science program offers a curriculum that combines a grounding in the fundamentals through coursework with essential research experience through thesis and project work. The Physics Department has faculty actively engaged in several areas of research who provide students with opportunities to participate in doing physics, both theoretical and experimental, not just studying it. You should explore the options available to you and seek out these opportunities. We expect that your time here will pass quickly. We hope that you will gain much from your stay with the department and wish you success in your program.

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Other Sources of Information

This handbook is intended to provide information specific to the graduate program in the Physics Department. Official details of general University of Minnesota Graduate School policies and procedures can be found in several sources. These include the UMD Catalog, which includes a section on the Graduate School and course descriptions, the UMD Graduate School Office, and the University of Minnesota Handbook for Graduate Assistants, which contains University policies for graduate students holding teaching or research assistantships. The UMD Graduate School Office is in 431 Darland Administration Building (431 DAdB). Other offices that may be of interest at various times during your career are the International Student Adviser's Office in 237 Kirby Student Center (KSC) and the Career Services Office in 22 Solon Campus Center (SCC). Within the department, answers to questions can often be found from the Director of Graduate Studies, the Department Head, or the Department's secretary in MWAH 371, the Department Office.

UMD Physics Home Page
UMD Graduate School Office
UMD Career Services
UMD Catalog
UMD Home Page
U of MN Graduate School Home Page (Twin Cities)

Important Tasks for New Students

Upon arriving in Duluth several administrative matters need to be attended to promptly. Taking care of these items will help get your graduate career at UMD off to a smooth start. Students holding Teaching Assistantships must process a number of documents to ensure their paychecks begin arriving on schedule. Delays in processing the paperwork will cause delays in the arrival of the first paycheck. (Such a delay will not reduce your total earnings!) Delayed processing can also slow the processing of tuition waiver benefits for TAs. A check-off list of forms and tasks is at the end of this handbook.

1. Apply for a Social Security Number (New International Students)
   Social Security Administration Office, 130 W. Superior Street, Duluth. Several documents cannot be processed completely until you have applied for a Social Security Number. Check in first with the International Student Advisor (KSC 237) for instructions.
2. Check-in with the Director of Graduate Studies (All Students)
   Prof. Habig is the DGS for the 2009-10 academic year. Office: 384 MWAH (MWAH = Marshall W. Alworth Hall.
3. Visit the Physics Department Office. (All students)
   Many forms need to be filled out and the Department Secretary (371 MWAH) can get you started. If you have a teaching or research assistantship (TA or RA), you will need to provide proof of employability to meet federal requirements. This usually requires two forms of identification. U.S. citizens can provide a U.S. Passport (sufficient alone) or a driver's license with photo and a U.S. Social Security Card.

International students can provide their Passport, I-20, and Social Security Card (or proof of application for one) when received. (See item 1 above!). A daunting number of other forms must also be completed. You will also be issued keys for your office and teaching labs and be assigned a mailbox in the Department office. You should also give the secretary your local address and telephone number as soon as you have found an apartment or house in Duluth.

4. Attend UMD Orientation Sessions for New Graduate Teaching Assistants (GTA's) There are two sets of orientation sessions. A session for international students precedes a general orientation session for all TA's. Details of the schedules for these sessions are provided by the Graduate School Office. There is also a mandatory health insurance meeting for **all** graduate assistants during orientation.
5. Course Selection & Registration Advisement (All Students) Meet with the Director of Graduate Studies (DGS) to discuss course selection. This is an opportunity to identify courses appropriate for your intended program and background. Registration is done through an on-line system. You can begin at http://www.d.umn.edu/registrar/. Please be aware that a late-registration fee will be assessed to you if you do not register before classes start. Once you have determined your class schedule, you should provide a copy of your schedule to Professor Maps for the purposes of assigning and scheduling TA duties before classes begin. A form will be provided for this. This schedule will be filled out after you discuss your course selections with the DGS. You will need to discuss any changes in your schedule after this point with the faculty member coordinating labs and the DGS.

Degree Requirements

The department offers two routes to the M.S. degree, referred to as Plan A and Plan B. Plan A includes the completion of a Master's thesis based upon original research carried out under the direction of a faculty member. Plan B involves the completion of a project that may consist of participation in ongoing faculty research and preparation of a report on that work, or the preparation of three papers in connection with course work under faculty supervision. The information below is intended as a guide for planning programs. Official Graduate School requirements are detailed in the UMD Catalog. The M.S. degree requires 30 graduate credits. Students may elect to complete a Master's thesis (Plan A) or additional coursework and one or more projects (Plan B). All students take 11 credits in a common core of courses (including Phys 5501, 5511, 5521 and 2 credits in 5090), 3 credits in one of our "Methods Courses" (Phys 5052 or 5053 or 5061) and 6 credits in a minor or related fields. Plan A requires 10 thesis credits; Plan B requires one or more projects requiring a total of 120 hours of work, preparation of a written report for each project, and 10 additional course credits in physics. These courses may include 4xxx courses, if appropriate and if approved for graduate credit; for distinctly interdisciplinary programs, the courses may be outside physics. In all cases, the overall plan of study and selection of elective courses must form a coherent program and be approved by the director of graduate studies.

- Plan A and B common requirements:
  - 11 credits physics core
    - Phys 5521 Quantum Mechanics I (3 cr)
    - Phys 5501 Advanced Classical Mechanics (3 cr)
    - Phys 5511 Electrodynamics (3 cr)
    - Phys 5090 Seminar (twice, for 2 cr)
  - Methods course

        - Phys 5052 Computational Methods in Physics (3 cr) OR
        - Phys 5053 Data Analysis Methods in Physics (3 cr) OR
        - Phys 5061 Experimental Methods (3 cr)
    - 6 credits in courses eligible for graduate credit in related fields, or a minor in a related field
    - Final oral exam that includes a presentation of thesis/project work at a departmental colloquium, followed by examination by the committee selected for the student.
- Plan A additional requirements:
    - Thesis, including 10 cr of Phys 8777.
- Plan B additional requirements:
    - 10 credits of additional physics graduate course work. The courses used to meet the additional 10 credit requirement may include 4000-level courses if appropriate and approved for graduate credit. For distinctly interdisciplinary programs, some of these courses may be drawn from related fields outside physics. In all cases, the overall plan of study and selection of specific elective courses must form a coherent program and must be approved by the Director of Graduate Studies.
    - One or more Plan B projects requiring a minimum of 120 hours of total effort, and preparation of a written report for each project.

Note: The information presented here is as accurate as possible. However, the UMD Catalog should be reviewed before finalizing a degree program in consultation with the Director of Graduate Studies in Physics and the research project or thesis advisor.

Research

The department believes participation in research is a crucial part of graduate education in physics for all students, since research is where new physics is done. Research is both demanding and rewarding. Research participation takes you beyond the finite framework of homework assignments and textbook presentations to the investigation of open-ended problems. This involves exploring the current physics literature and working on problems, experimental and theoretical, whose solutions may now require days or weeks (or more!) of sustained effort, instead of hours. One goal is to develop the ability and confidence to apply your hard-won knowledge and techniques of coursework to new situations and to contemporary problems. Research also provides an opportunity to learn and even invent new techniques. All of this cultivates the skills to solve real-world problems in a variety of contexts and with a variety of analytical tools later in your career. Research also permits a narrow topic to be explored in greater depth, allowing a deeper understanding and mastery of the subject - an essential part of the graduate program experience.

The two tracks to the M.S. degree offer different exposures to research. Plan A programs involve a heavier involvement in research. Plan A students should expect to devote much of their second

year to thesis research and writing. Plan B students also participate intensively in faculty research efforts. The problems involved are, however, more likely to be smaller pieces of larger ongoing research efforts, requiring the same intensity of effort as thesis work, but usually not making the same demands on time throughout the second year. The Plan B program replaces the extended research involvement of thesis work with additional coursework. In both Plans the research effort is directed by a faculty member, and the results of the work must be presented in written form as a thesis or project report.

Summer support

Because of the importance it attaches to participation in research as an integral part of the graduate program, the department strives to provide financial support in the form of stipends to students for the summer following their first year. This support is intended to permit you to remain on campus during the summer months and get started in your research work with a faculty member. Summer months are an ideal time to plunge into research, since there are usually no other obligations (homework to do, labs to teach, papers to grade, etc.) to interfere with concentration on the research project. While much can be accomplished during the summer, it is usually the case for Plan B programs that some additional work will be necessary during the second year to complete and write up research results. For Plan A programs the summer represents just the start of thesis research.

Funding for summer research support may come directly from a faculty research grant or from departmental resources. To be considered for departmental summer support, you will be asked to prepare a brief proposal in the spring semester describing the research project, including goals, methods and a timeline for progress on the project. The first step is to have conversations about research opportunities with the various faculty. Then the proposal is developed after an advisor and suitable research topic have been identified. The faculty member who will supervise the project must initial the proposal before you submit it to the Director of Graduate Studies. These proposals are typically due in April of each year. While the department tries to support all worthy proposals, in situations of limited funding the process is competitive. Decisions are made by the DGS in consultation with other faculty. Support for less than a full summer (nominally 10 weeks of effort) may be arranged by mutual agreement of the faculty advisor, student, and DGS. Support for a second summer is rarer and contingent upon availability of funding and a compelling reason for continued support. The summer support provided by the department in this form carries no tuition waiver benefits for Summer Session courses.

The department usually offers a part-time TA position to assist in any Summer Session courses it offers. This TA position can be used as partial summer support or combined with other support as the situation permits. Anyone requesting departmental support for a second summer should expect that any support awarded will be, in part or in full, in the form of a summer teaching assistantship.

Graduation Procedures

Degree program form: Before registering for fall semester of the second year (or after 15-18 credits have been completed), you must file a degree program form with the UMD Graduate School Office. You will not be allowed to register until this is done. This form is available from that office (or check on-line with the UMD Grad School web page) and details all courses you plan to use to satisfy degree requirements, whether the degree will be Plan A or Plan B, and any declared minor. It also lists the recommendations for the three members of the final examination committee. You should discuss possible committee members with your research advisor and the DGS. Then you must visit each faculty member to be listed and obtain their agreement to serve on the committee in advance of listing them on the form. The program listed on this form must be approved by the faculty advisor and the DGS before filing with the Graduate School Office. Students declaring an official minor must also obtain the approval of the minor field DGS. Changes to the program can only be made by petition to the Graduate School Office.

The Graduate School confers degrees monthly (see the UMD Graduate Student Handbook or UMD General Bulletin) and you must file an **Application for Degree Form** (obtained from the UMD Graduate School Office) by the first working day of the month you intend to graduate.

Thesis/Project Presentation and Final Oral Examination: Before graduation, all students must pass a final oral examination. This exam is conducted by a committee of at least three faculty designated on the degree program form, including the advisor and one member from outside the department. The exam consists of two parts. The first is a public presentation of the project or thesis work at a departmental seminar. The second part is a closed examination by the committee.

Before the final exam can be scheduled, the advisor will provide initial approval to distribute the thesis or project paper to the committee members. In the case of Plan A programs, the committee members review the thesis and certify that it is ready to be defended before an exam can be scheduled. You will need to negotiate a date and time acceptable to all committee members that also satisfies Graduate School requirements. The Graduate School requires that Plan A students file the title of the thesis at least two weeks before the examination.

Once a mutually acceptable date for an exam has been determined, the Physics Department Office and the UMD Graduate School Office should be informed of the exact exam date so that necessary forms and announcements can be prepared. *Scheduling an exam requires notice to both the UMD Physics Department Office and the UMD Graduate School Office of at least one week in advance of the exam date.* Provide a date, time, and talk title (and abstract, if desired) to the department office for the seminar announcement. A room will be reserved if necessary. Do not assume that the final exam can be scheduled on very short notice. *Do not make travel plans to depart from UMD based on a presumption of a certain exam date without the prior concurrence of all committee members.*

Questions asked during the exam can span all areas of physics. Often the thesis or project report provides a starting point for examiners' questions. Outside committee members often pursue questions related to courses students have taken with them. Faculty advisors, as committee

chairs, can usually provide some advice on how to prepare for the exam. The committee frequently requires modifications to the thesis or project paper before its final acceptance.

Commencement exercises occur each year at UMD in May. Graduate students who wish to participate in these ceremonies may do so, provided they meet the requirements detailed in the UMD Graduate Student Handbook. Please note the early deadlines that must be met for participation contained in that handbook or are announced early in Spring semester.

Before you leave UMD: All students should complete an exit survey obtained from the DGS or department head, leave a new mailing address, and return all keys before departing from UMD.

Graduate Assistant Procedures and Duties

The usual Graduate Assistant appointments run from roughly late August through late May. Research assistant duties are assigned and supervised by the faculty member directing the research. Teaching assistants are assigned duties at the start of each semester that will require twenty hours per week on average for 50%-time appointments. Decisions regarding re-appointment for a second year are made in the spring of each year. These decisions are based upon satisfactory performance in both assigned TA duties and program coursework. Offers of support for a second year are made typically in early April. A formal binding commitment is required by April 15th in most cases. The department believes that under most circumstances all necessary work for the program can be completed in two years with TA support, therefore re-appointments beyond the second year are usually not made. Exceptions to this policy may be made in situations where students have made substantial progress in research and can significantly enhance their achievements in this work by support beyond the second year, or where a third year is warranted by special circumstances.

All Graduate Assistants (teaching and research) must register each semester to be eligible for the assistantship. Furthermore, federal rules for exemption from certain payroll taxes require enrollment for at least six credits. International students must meet immigration rules for full-time status. Therefore the Department requires all students holding assistantships to register for at least 6 credits each semester to meet these requirements.

Safety training: Laboratory safety includes both performing research work in a safe fashion and conducting instructional labs in a manner that minimizes unnecessary hazards to students. All graduate assistants (teaching and research) and any students engaged in research must attend annual safety training and complete on-line safety tutorials. These sessions are designed to familiarize you with your rights and responsibilities in maintaining a safe environment and acquaint you with sources – both in the department and campus-wide - to learn more about specific concerns you may encounter during research and teaching. Typically departmental training sessions will be conducted at the start of each academic year and at the start of each spring semester as needed. Annual refreshers are mandatory. Directions for completing the on-line training will also be provided at that time. Failure to complete the training in a timely

fashion may result in a suspension of pay. Denise Osterholm serves as the department's Lab Safety Officer and serves as the main contact person on questions of lab safety.

Tuition and insurance benefits: Teaching and Research Assistants receive a tuition benefit valued at twice the percentage of their appointment. For the usual 50% appointment, this means a full tuition waiver - up to 14 credits per semester - is granted. If you register for more than 14 credits in a semester, you will need to pay the difference in tuition beyond 14 credits. Health insurance benefits are also provided for a modest premium. A complete description of tuition and health insurance benefits can be found in the University's Graduate Assistant Handbook. There is a mandatory insurance meeting for all graduate assistants during the week before classes in the fall. You must still pay several other fees. Please note that holding an assistantship during the regular academic year does not provide tuition benefits for Summer Session courses. Health insurance benefits do extend over the summer months under most circumstances; see the Graduate Assistant Handbook for detailed discussions of benefits. If you wish to take courses during the summer, you should consult with the DGS.

Pay dates: Graduate Assistants are paid every two weeks. New assistants should process the necessary paperwork as soon as possible after arrival. Under ideal conditions the first paycheck will arrive in late September. Unfortunately, due to deadlines and possible delays in processing paperwork, it is not uncommon for the first paycheck to be delayed until early October, covering the first two pay periods. Paychecks are distributed to mailboxes in the department office or you can arrange for direct deposit of paychecks into your bank account. A form for initiating this is available on-line.

Outstanding GTA: Each year the department selects an Outstanding Graduate Teaching Assistant for the year. The selection is based upon sustained superior performance of TA duties. This award is presented each spring as part of an event sponsored by the Swenson College of Science and Engineering to recognize the contributions of the graduate teaching assistants to the teaching mission of the University. The winner receives a certificate, and in recent years the American Association of Physics Teachers has provided a year's membership in AAPT, including subscriptions to Physics Today and either AAPT's Physics Teacher or American Journal of Physics.

GTA Instructional Duties

Teaching Assistants usually have a mixture of duties. These include supervising and grading laboratory sections for introductory physics courses, grading homework and tests, and leading problem-solving help sessions for students in introductory physics. The assignments are made by the faculty supervisor for the labs of the various introductory courses. TA's should provide a copy of their class schedule for the upcoming semester to the lab supervisor before the end of each semester to simplify scheduling lab and help sections.

One or more faculty (D. Johnson, J. Maps) serve as Coordinator for TA's. They are responsible for assigning your duties, providing guidance and assistance in your weekly preparation for lab and overall coordination of labs for Phys 1001-2 and Phys 2011-2.

Lab grades and privacy: Grades assigned by TA's should be carefully maintained and securely stored. Standardized record sheets for this purpose are from the TA coordinator. At the end of the semester you should make two photocopies of grades. Give one copy to the instructor in charge of each course by the beginning of final exam week. Check with the instructor to find out what kind of net or final result (total points, average score, etc.) should be included with individual grades in the record book. The second copy should be submitted to the secretary in department office. Give the original gradesheet to the TA coordinator. Each sheet should be labeled with the appropriate course and section numbers, term and year, and your name. These records are important, since they represent the only separate documentation of the student's effort in lab and may be reviewed if a student must repeat the course. Questions you may have on lab grading should be directed to the TA coordinator. Individual instructors may also give you specific additional lab grading guidelines. If a laboratory student asks how his or her lab grade is included in the overall course grade, refer the student to the overall course instructor; exactly how the lab grade is incorporated into the course trade varies somewhat with each faculty member and only that person should answer such a question.

Grades are **private information**. As such, security is a *very* important consideration. Grade records may *not* be maintained on a portable device such as a laptop computer or a removable drive. Use the paper gradesheet to record lab grades and keep this secure in your office desk. Return of graded material must be done in a fashion to maintain the privacy of the information – usually by handing it back directly to the student. Total grades or other comparable information on tests, homework, or other multiple page items should be written on an inside page, not on the top page where it can be easily seen by others. You may be notified by e-mail that you are to complete training in proper handling of data through on-line courses. You are expected to complete this training promptly once notified.

All graded reports must be returned in lab. Grades are private information and any graded papers must be returned in a fashion that maintains the student's privacy. They cannot be returned in the open boxes in the hallway or outside your office. If graded items are laid out on a desk or table, the grade cannot be visible to other students. If the grade is visible, hand items back directly to the student. Graded materials to be returned at the end of the semester can be returned at the final exam.

Lab manuals: Instruction manuals for laboratories for Phys 1001-2 and Phys 2011-2 are purchased by students at the UMD Bookstore. We will distribute copies to lab instructors once TA assignments are finalized. If you have a copy of a manual you are no longer using, please return it. Phys 1001 will use standardized lab worksheets as the basis for submitting written work. Students will be required to download and print these before coming to lab. Pre-lab exercises used in Phys 2011 are in an appendix at the back of the manual.

When you find errors in the manuals, please note them in the desk copy of the manuals in each lab room. This will be helpful in improving them in the next revision.

The schedule for labs is subject to change during the semester. The order of experiments in the manuals is not necessarily the order in which they will be done. We will try to keep the labs in phase with the lecture material, but in some courses this will not always be possible, particularly in Phys 1002. The lab schedule will be available via links from http://physics.d.umn.edu/ .

Preparation before lab: Work through each lab *completely* in advance of your sections. Please don't be caught unprepared. If you have not worked through the experiments fully, you will not appreciate the problems students encounter, recognize improbable or obviously flawed values for measurements, or be unable to provide the appropriate guidance. Time will be set aside on Fridays and Mondays for you to work with the TA coordinators to make sure you have worked through labs and all your questions have been answered.

Prepare a brief introductory talk for the start of the lab period. Aim for less than 15 minutes. For the first lab in Phys 1001 and 2011 you will need to devote some additional time to describing generally how lab will operate. Refer students to the introductory section of the lab manual and emphasize key points. Throughout the semester you will need to reinforce various points made in the lab manual repeatedly for them to become habits for the students.

Tell and expect your students to read through the lab in advance. Instead of planning to explain all the details of an experiment, emphasize operation of specialized equipment, new techniques, or items of particular interest expected in reports. Take time later in lab to clarify common stumbling points as the opportunities arise. After the first week, the start of the lab is also an opportunity to give corrective feedback on common mistakes or errors found when grading the previous lab.

During lab: All tables in a lab should be used unless section enrollment is less than 12. Lab groups should be as small as the available equipment permits. Students work in groups of two or three. Allow groups of three to form only if more than 12 students are in a section, or in a small section with an odd number of students would leave one student working alone. Generally section enrollment is capped at 18. In some cases another student may be permitted, forcing a group of four. When large groups form, rarely will more than two students be actively engaged in thinking; the others are merely scribes and lab becomes too much of a social event.

After your brief introductory talk, let the students get started. Circulate about the room as students work. Ask questions to help them solve problems. Taking an active approach to running the lab is more effective and satisfying than sitting passively, waiting for students to come to the

front with questions. Keep an eye on data being collected to identify problems before students invest time in analyzing it. One of your responsibilities as a teaching assistant is to spot this, point it out to the students, and provide some guidance to get them back on the right track. Once again, if you haven't prepared adequately by working through the lab yourself in detail, you won't be familiar with what typical data and graphs should look like.

For students turning in reports/notebooks after the end of lab, you must sign your initials on the original work in their notebook or worksheet, and that original must be submitted for grading.

For Phys 2011-2, set and announce goals for preliminary analysis in each lab to be completed before students leave lab. Don't allow students to simply take the data and leave lab. Insist on sufficient preliminary calculations and graphs to ensure good data. In many labs, most analysis can and should be completed in lab. Final write-up and summary can then be completed outside lab time. Record attendance and initial and date notebooks or data sheets before students leave lab.

Make notes in the desk copy of the lab manual about aspects of experiments that are especially troublesome – unclear instructions in lab manual, equipment not well matched to requirements of experiment, experiments that are too long or too short, common difficulties encountered by many students, etc. This will be helpful to other lab instructors and in future revisions to lab materials.

Equipment problems: Problems with equipment should be brought immediately to the attention of our Lab Services Coordinator, Denise Osterholm, so a replacement part can be found or repairs can made in time for the next section. Her office is on the ground floor in the machine shop, MWAH 31, phone 6312. There is a telephone available for this purpose in MWAH 245, the central lab prep room.

It is your responsibility at the end of every lab section to ensure each table has the necessary equipment. Require your students to arrange equipment neatly on the table before leaving and leave a clean table for the next lab section. If your students don't leave a neat table, you are expected to do it. Tables should not be missing parts or have extra parts at the end of lab. If the equipment is arranged neatly, it's easy for you to see what's missing or extra. Discourage students from taking an item from another table. If something is broken or truly missing (not merely at another table or on the floor) call Denise Osterholm immediately.

Lab due dates: Exact procedures for setting due dates for lab work will be discusses during departmental TA orientation at the start of each semester. Phys 1001 labs use standardized worksheets. These have usually been due at the next lecture day for the course: Tuesday labs are due Wednesday; Wednesday and Thursday labs are due Friday. These are not intended to be detailed lab reports, but brief yet intelligible documentation of what data were collected, how analyzed, results, and answers to a few questions requiring interpretation of the results. Phys 1002 labs are usually completed and submitted for grading at the end of the lab period.

In Phys 2011-2 labs you should establish a due date for the notebook that is 2 to 3 days after the lab. This will give you time to grade the notebooks and have them ready for the next lab meeting.

Students are to put notebooks to be graded in the designated locked box along the 2nd floor hallway, adjacent to 275 MWAH. These will be labeled by course, section, and lab instructor.

Grading homework and tests

Your assistantship duties will almost certainly include grading homework and/or tests. The details of how this will work will vary with each course instructor. Grading duties may be shared with another graduate teaching assistant or with an undergraduate grader, depending on the course and the circumstances. As a result, some of this work may be distributed unevenly in time – one week may not involve any effort, while the next requires a significant amount of effort. Most instructors expect to be able to give graded assignments back to students promptly after being collected so students get feedback about their progress. You will need to work out the details of recording grades and returning work to the instructor or students with each instructor individually.

For **test grading**, careful grading is more important than very fast grading. First and foremost, the score you assign should have a rational basis and not be arbitrary. Keep in mind that the score on a particular problem should realistically reflect the knowledge of physics demonstrated by the student in working the problem. As you should know by now, there is often more than one way to solve a problem. You are expected to evaluate the correctness of the solution *even* if the method deviates from the particular series of steps offered by the instructor as a possible solution. Exercise judgment.

Discuss with the instructor the style of grading desired. Some instructors prefer that you explicitly indicate the deductions (e.g. -2) at each error. Others instructors prefer that grading of each problem start with zero and points add up according to how far a student got on a problem, unless the problem is almost completely correct except for some minor detail worth a point or two. In all cases, look for any hints of understanding - correct methods or reasoning - for partial credit. When in doubt about how to grade a particular case, talk to the instructor for guidance.

Please use a red pen and write legibly - both the instructor and the student must understand what points you have assigned or deducted. Write short helpful hints or comments to indicate errors as time permits. Usually solutions are discussed in class or posted so such notes don't need to be elaborate. (On final exams, comments are unnecessary; speed in completing the grading - *carefully* - is most important.) Again, exercise judgment! Don't assign half-points unless directed to do so.

Grading of a test or exam is usually a shared responsibility. Tests should not be taken out of the department – do the grading in your office and keep the test papers easily available for other graders to work on. The process works fastest for all involved if you turn the test paper to the next ungraded problem for the next grader and pass along each pile of papers as soon as you are done. The last person to grade a test should total the scores of all the problems and write the result preferably on an inside page (e.g. the last page or inside the bluebook) to preserve privacy of the grade information. Return the grading guide or "key" to the instructor when done. If there appears to be a problem on a particular paper, attach a note to the test for the instructor to see.

Questions you have about grading of homework or exams should be directed to the instructor in charge of the course.

Final exam grading: Your assistantship responsibilities do not end with the end of labs each semester. Course instructors may reasonably ask for your assistance in grading final exams, just like tests during the semester. Typically, course grades are due 72 hours after the final exam ends, so there is some urgency to grading exams promptly. You should not plan to leave campus at the end of the semester before you have turned in all grades and completed all final exam grading chores. The instructors should be flexible enough to work around final exams you must take for your own classes, but be sure to discuss final exam grading plans with the course instructors in advance of final exam week.

Miscellaneous Department Information and Policies

Colloquia & seminars: The department holds occasional seminars or colloquia featuring visiting physicists or in-house speakers making presentations on recent and ongoing work in physics and related fields. These talks provide valuable exposure to a range of topics beyond each student's course and research work. ***You should make every effort to attend these talks.*** Students who carry out research during the summer are often expected to present a seminar describing their work during their second year.

Department office equipment: The equipment in the department office, in particular the printer, fax, and photocopy machine, is for official department business use only. Computer printing services for course-related work are available through Information Technology Systems and Services (ITSS) central computing facilities and in the various departmental labs. Photocopying of gradesheets, etc. by TA's at the end of the semester, etc. *is* appropriate use of the photocopier. Personal photocopying in small amounts (a page or two) may be done at a charge of 10 cents per page, with permission of the department secretary. Large amounts of photocopying should be taken to the copy center on campus. Photocopying of entire books is not permitted and is illegal under U.S. copyright law.

Mailboxes: You should check your mailbox in the department office regularly. This is a primary way of distributing University and department information. While it may be convenient as a temporary forwarding address when first coming to Duluth, the department address should not be used for personal mail. Please arrange for personal mail (including bills, magazines, etc.) to be mailed to your residence as soon as you have settled in. Please keep the department office informed of changes in your local address and phone number. Incorrect or outdated addresses can cause important information to be mis-directed.

Building security and the common welfare: All graduate students should take responsibility for seeing that their offices as well as the department's various lab rooms are kept secure and locked, especially outside normal weekday work hours. Think twice about leaving your office unlocked and unattended, even during the day. Many labs contain expensive equipment that is important to both the instructional and research work done in the department. Consequently, you

should have a strong interest in taking an active part in preventing theft or vandalism of equipment you may need. Graduate students are issued keys to allow access to many of these resources. Please use your keys and keep department offices and labs locked after normal working hours and at all times on weekends, even if you're in the room working. Cultivate the habit of checking not only that your own office door is locked when you leave for the day, but also that rooms you use frequently are also locked. If you open hallway windows, remember to close them before you leave - don't rely on someone else to do it. During summer, the building is often coolest when the windows are kept shut. In the same spirit, please take care to keep public and shared areas that you use clean and neat. No one enjoys working around the clutter or messes left behind by another. Also keep in mind that others may be working nearby - keep sound and noise to reasonable levels.

E-mail: All students receive electronic mail (e-mail) accounts on the campus's central computers. This is an official means for distributing information. You should get in the habit of checking your e-mail at least as regularly as you check your office mailbox. Network access is available through public access terminals maintained by Information Technology Systems and Services (ITSS), wide-spread wireless access points to the campus network, as well as computers in the computational physics room, MWAH 397. ITSS maintains guidelines on appropriate use of computer accounts on-line.

Other computing resources: In addition to central computing facilities and individual research labs, the department maintains some of its own computing resources. Among these are:

- The computational physics lab (397 MWAH) equipped with several PCs running Linux and a printer. This lab provides access to the internet.
- The instrumentation/experimental methods lab (379 MWAH), equipped with 4 Windows PCs and software for programming, graphing, data acquisition and analysis. A shared printer is attached to these machines; these have wireless access to the campus network.
- A departmental web server (physics.d.umn.edu) provides information and materials for many courses and provides services to the computational physics lab. Access is restricted to the d.umn.edu domain and requires use of VPN software for off-campus access.
- An instructional lab server and wireless network serves computers in introductory physics labs on the second floor of MWAH; this is *not* connected to the campus network.

Physics Faculty and Staff Office, Phone and E-mail Directory is available on-line from the Physics Department homepage (**http://www.d.umn.edu/physics/**)

The University of Minnesota is an equal opportunity employer and educator.

NEW GRADUATE STUDENTS IN PHYSICS
Things To Do and Forms to Fill Out Check-list

(ALL)=All Students
(GTA)=All Graduate Teaching/Research Assistants (including international students)
(INTL)=International Students

- ___Apply for Social Security Number (INTL)
- ___I-9 Employment Eligibility - on-line completion in dept. office (GTA)
- ___IRS W-4 Tax Withholding (paper or on-line) (GTA)
- ___Social Security # for Payroll Purposes (GTA)
- ___Alien Information Request (U of M) (INTL)
- ___Direct Deposit Option (paper or on-line) (GTA)
- ___IRS 8233 Withholding Exemption (INTL)
- ___Tax Treaty Affidavit (INTL)
- ___W-8BEN (qualifying INTL)
- ___Substantial Presence Test (INTL)
- ___Human Resources Information Form (GTA)
- ___International Student Orientation Program (INTL)
- ___New Graduate Assistant Orientation (GTA)
- ___Pick-up Office/Lab Keys from dept. office (GTA)
- ___Inform Department Office of Local Address/Phone (ALL)
- ___Course Advisement with DGS (ALL)
- ___Registration (ALL)
- ___Copy of Class Schedule to TA coordinator (GTA)