

# Physics and Astronomy



Department of Physics and Astronomy

Western University

## Physics and Astronomy Graduate Program Handbook

PHYSICS AND ASTRONOMY GRADUATE PROGRAM  
GUIDELINES AND REGULATIONS

December 2017  
(v14Sept2020)

## Version History

September 14, 2020 (Sigut): Updated course requirements for Physics and Astronomy MSc and PhD degrees. Removed tables “Successful Degrees” as they contained incorrect information.

## ACKNOWLEDGEMENT

This Handbook contains material that was written by various Graduate Chairs of the Department of Physics and Astronomy as well as from Astronomy Program Coordinators. It was put together in this form with a lot of input and help from the Academic Coordinator, the Assistant to the Chair and the Chair of the Department of Physics and Astronomy. The idea to organize all graduate information in the form of a handbook was inspired by a discussion with Azi Chant from the Department of Biology. Their handbook served as a start.

Particular thanks go to Aaron Sigut, Bob Sica, Sarah Gallagher, Stan Metchev, Shantanu Basu, Clara Buma and Jodi Guthrie.

July 2015

Silvia Mittler

---

## PREFACE

A message from the Department Chair

We welcome you to our Department! Graduate school is an exciting time and brings many significant changes from your experiences as an undergraduate. Courses are now smaller and more tailored to your interests in Physics and Astronomy. You will now spend less time in the classroom and begin solving problem that don't have a solution in the back of the book. Many of you will be both student and teacher, as you lead students through their laboratories and tutorials.

The Department of Physics and Astronomy will always be there to help you through your studies. This handbook provides a "first-stop" resource for you to use, assembling all of the information about the Department in a single place to consult when you have a question. It is a living document and will be updated as required by the Graduate Chair. If you have a question or a problem do not hesitate to discuss it with us. Your supervisor(s), your Advisory Committee, the Graduate Chair and I are available to help you reach your academic goals.

Welcome to Western!

Bob Sica  
Chair, Physics and Astronomy

## A message from the Physics and Astronomy Graduate Council

Dear Fellow Graduate Students,

On behalf of the Physics and Astronomy Graduate Council we would like to welcome you to a new academic year in the Department of Physics and Astronomy.

The P&A Graduate Council consists of graduate students at the MSc and PhD levels in both Astronomy and Physics disciplines. We are advocates for the interests of our graduate students within the Physics and Astronomy department and campus-wide as representatives on larger student organizations such as the Society of Graduate Students (SOGS) and the Graduate Teaching Assistants (GTA) Union PSAC Local 610. We also assist in outreach and event planning, and aim to promote scientific discussion and social interaction between graduate students in all physics and astronomy disciplines.

There will be many exciting events for graduate students, either through the department or through SOGS and other campus organizations. We encourage you to get involved and will notify you throughout the year to keep you informed about opportunities to volunteer, interact with faculty and fellow students, and enjoy your time at Western.

If you would like to become a member of the Graduate Council, or a SOGS or PSAC rep, e-mail [pagradcouncil@uwo.ca](mailto:pagradcouncil@uwo.ca) for details.

Feel free to e-mail the grad council ([pagradcouncil@uwo.ca](mailto:pagradcouncil@uwo.ca)) with any questions you have.

Visit our website at

[http://www.physics.uwo.ca/graduate/current\\_students/grad\\_council/index.html](http://www.physics.uwo.ca/graduate/current_students/grad_council/index.html) for useful information, links to social media, and a calendar of events.

Your Graduate Council,

Sayantana Auddy,  
Mark Baker  
Mitchell  
Brocklebank  
Nirosh Getangama  
Cameron Hopkins  
Ryan Hopkins  
Laura Lenkic  
Sahar Rahmani  
Dilini  
Subasinghe  
Neven Vulic

A message from the Associate Chair (Graduate Education)

Dear Graduate Students,

On behalf of the Physics and Astronomy Graduate Affairs Committee, I am delighted to welcome you to the Department of Physics and Astronomy at Western. We strive to provide a rigorous, supportive, and collegial scholarly and intellectual environment, and to promote and celebrate the successes of our students.

Graduate students in Physics and Astronomy take advanced coursework to deepen their knowledge of specific areas in Physics and Astronomy and related disciplines; expand their repertoires of scientific techniques and skills; teach undergraduate students to develop their skills as educators; and work closely alongside our faculty members. Most importantly, our students design, conduct and publish cutting-edge research, tackling important questions reaching from astrophysics to nanotechnology and medical physics.

We in Physics and Astronomy are very proud of the successes of our graduate students. They work hard, they work knowledgeably, and they help making differences in the world. I wish you every success during your time in one of our programs.

Silvia  
Mittler Associate Chair (Graduate  
Education)

## Brief History of Graduate Programs in Physics and Astronomy at Western

Although the Physics Department can be said to have started in 1915, it was not until 1919 that the first undergraduate students were registered in the program. Graduate studies got started soon afterwards in 1923-24 with the graduation of 2 students with MA degrees in Physics. The next milestone was in 1947 when the University established a Faculty of Graduate Studies and introduced the new degrees of Master of Science and Doctor of Philosophy. In that year the department graduated eight M.Sc. students, and in 1954 the department graduated its first Ph.D.s.

Until 1959 astronomy had been represented academically by just a few courses, but in that year an honors astronomy program was introduced in what was then called the Department of Pure and Applied Mathematics and Astronomy, and in 1966 Astronomy became a separate department. By 1963 the first M.Sc. in Astronomy was awarded. In 1969 the new department graduated its first Ph.D. in Astronomy.

In 1996 the Physics and Astronomy Departments amalgamated into the Department of Physics and Astronomy, but continued to be separate graduate programs in Physics and in Astronomy as before.

At the time of amalgamation there were about 35 graduate students in the two programs (5 in Astronomy, 30 in Physics). Since then there has been a large expansion of the programs, particularly Astronomy) to about 90 students in recent years (35 in Astronomy, 55 in Physics).

Dr. Donald R. Moorcroft, July 2014  
Professor Emeritus

# The Department of Physics and Astronomy Graduate Handbook

## CONTENTS

Acknowledgement	1
Preface	2
Message from Chair of Physics and Astronomy	2
Message from the Graduate Council of Physics and Astronomy	3
Message from the Associate Chair (Graduate Education)	4
Brief History of Graduate Programs in Physics and Astronomy at Western	5
Content	6
A DIGEST OF IMPORTANT INFORMATION & DATES AFFECTING GRADUATE STUDENTS	8
PHYSICS AND ASTRONOMY GRADUATE PROGRAM GUIDELINES AND REGULATIONS	11
1. ADMISSION	11
A. Admission Requirements	12
B. How to Apply?	12
2. ADMINISTRATIVE RESONSIBILITIES AT THE START (Practical Issues)	13
A. Western ONECard	13
B. Obtaining Keys for Physics and Astronomy	13
C. Western e-mail account	14
D. Parking	14
3. ACADEMIC EXPECTATIONS & RESPONSIBILITIES	15
A. Graduate Students	15
B. Supervisors	16
C. Co-Supervisors	18
D. Graduate Students Time Away	19
4. DEPARTMENT OF PHYSICS AND ASTRONOMY GRADUATE PROGRAM REGULATIONS	20
A. The Advisory Committee	20
B. Satisfying Progression Requirements	24
C. Course Requirements	24
E. Continuous Registration and Maximum Registration Period	27
F. Financial Responsibilities of the Department and the Supervisor	27
G. Financial Responsibilities of the Student	28
H. Extensions to Degree Completion Time	28
I. Appeals	28
5. PRIZES/AWARS/SCHOLARSHIPS, YEAR-X FUNDING	30
6. TEACHING ASSISTANTSHIP (TA)	32
7. GRADUATE STUDENT ETHICS CODE	36

8. STIPEND – UNDERSTANDING GRADUATE STUDENT PAY	37
A. Canadian Students and Students with a Permanent Resident Status	37
B. International Students	39
9. PHYSICS 9001- COMPREHENSIVE PHYSICS	40
Physics Comprehensive Component 1: Written Examination	41
Physics Comprehensive Component 2: Research Proposal or Written Literature Review Paper with Oral Defence	42
10. ASTRONOMY 9001- COMPREHENSIVE ASTRONOMY	45
Astronomy Comprehensive Component 1: The Tests and Final Exam of Astronomy 9610	45
Astronomy Comprehensive Component 2: Review Paper with Oral Defence	46
11. COLLABORATIVE PROGRAMS	47
12. PHYSICS M.Sc. RESEARCH REPORT	48
13. ASTRONOMY M.Sc. RESEARCH PROJECT	49
A. Astronomy M.Sc. Research Project Guidelines	49
B. Completing the M.Sc. Astronomy Project	49
14. THESIS	52
A. M.Sc. Thesis in Physics or Astronomy	51
A.1 Astronomy M.Sc. thesis guidelines	54
B. Ph.D. Thesis in Physics or Astronomy	54
15. CAREER PREPARATION	57
16. TRAVEL	58
Appendix	59
Appendix I: Manual for Physics & Astronomy Advisory Committee Meetings (ACMs)	59
Appendix II: Objectives for the Astronomy Written Comprehensive Exam	63
Appendix III: Policy and Guidelines for Faculty Members in Employment and/or Supervisory Relationships with Graduate Research Assistants, Post-Doctoral Fellows and Other Research Collaborators	65



## A DIGEST OF IMPORTANT INFORMATION & DATES AFFECTING GRADUATE STUDENTS

- 1) September 30 is the SGPS last date for Fall term registration without penalty. January 30 is SGPS the last date for Winter term registration without penalty. May 30 is SGPS the last date for Summer term registration without penalty.
- 2) September 15 is the last P&A department date for enrolling in full courses or Fall term half courses. January 15 is the last P&A department date for enrolling in Winter term half- courses.
- 3) At the beginning of the first term of enrollment an Advisory Committee (AC) will be assigned. There must be at least two Advisory Committee meetings (ACM) each year to be completed and documented on the student's OWL site.
  - a) Spring Advisory Committee Meeting period is typically in April and
  - b) Fall Advisory Committee Meeting period is just before Thanksgiving in October.All students can request an Advisory Committee meeting at any time and for any reason. All meetings of Advisory Committee, despite the reason, must be recorded on the appropriate form and placed in the student's file viewable to the AC members, the student and the Graduate Chair on the OWL website 48 h after the meeting.
- 4) New graduate students should introduce themselves to the department office staff; to the Graduate Affairs Assistant, Brian Davis, and to the Physics and Astronomy Graduate Chair, Dr. Silvia Mittler. Students are welcome to discuss any problems they might be having in the Department with these individuals or any other member of the Physics and Astronomy Graduate Affairs Committee. The TA Coordinator Team is composed of the Undergraduate Chair, the Graduate Chair and the Graduate Affairs Assistant.
- 5) Students and supervisors should familiarize themselves with the graduate portion of the Physics and Astronomy website and this handbook, including the availability of forms in PDF format that demarcate a student's progress through the Physics and Astronomy Graduate Programs. It is the supervisor's responsibility to bring the appropriate forms to Advisory Committee meetings. However, it is the student's responsibility to organize the ACM (time and location). For the thesis defense it is also the student's responsibility to bring the appropriate form for signature collection at the end of a successful defense. Timely completion of these requirements is required for progression and to ensure continued eligibility for WGRS funding.
- 6) These requirements and deadlines are set by the School of Graduate and Post-Doctoral Studies. A guide is available at <http://grad.uwo.ca> .

# PHYSICS AND ASTRONOMY GRADUATE PROGRAM GUIDELINES AND REGULATIONS

## 1. ADMISSION

### A. Admission Requirements

The Department of Physics and Astronomy offers graduate programs leading to MSc and PhD degrees in either Physics or Astronomy.

Applicants to our program are not required to take the Graduate Record Exam (GRE). However, it would be to the advantage of international students to take the GRE-Physics exam to both strengthen the application and to help the Graduate Affairs Committee more fairly evaluate it.

Students applying for MSc entry must have completed a four-year, BSc degree (or equivalent) in either Physics, Astronomy, or Engineering with at least a 70% (or B) average taken over the third and fourth year level undergraduate courses. Meeting this minimum standard, however, does not guarantee acceptance. Students with Engineering Degrees, should have some Physics courses at the third or fourth year level (e.g. Electricity and Magnetism or Quantum Mechanics) or take the GRE Physics examination.

Students applying for the MSc Astronomy degree are not required to possess an undergraduate degree in Astronomy. A Physics (or possibly Engineering) degree is also acceptable.

Students applying for PhD entry must have completed an MSc degree (or equivalent) in either Physics, Astronomy or Engineering with at least a 70% (or B) average taken over all MSc graduate courses. Meeting this minimum standard does not guarantee acceptance.

Entrance into an Accelerated MSc in Astronomy is available to Western students who have completed a 4th year honors research [P4999/A4999] with a final mark of 80% or higher and the following eligibility criteria with respect to undergraduate coursework. The student must obtain a sufficiently high final mark in a set of undergraduate courses equivalent to the following courses at Western: Astronomy 3302A/B (The Interstellar Medium); Astronomy 3303A/B (Galaxies); Astronomy 4101A/B (Stellar Astrophysics); Astronomy 4602A/B (Gravitational Astrophysics and Cosmology). The average of the final marks in these courses should be 80% or higher and a minimum grade of 70% in each individual course. The Accelerated MSc in Astronomy gives a head start to MSc research with the Honors Research conducted with same supervisor as planned for MSc thesis. Students can work on their research in the summer immediately after the BSc, if agreed upon by the supervisor. In this case, they will be hired as a summer undergraduate student and paid by their supervisor. These students should apply for a summer NSERC USRA or the supervisor should apply for a pre-thesis award to cover some of the costs. These students have effectively 4 terms to fulfill the requirements.

All student acceptances are made by the Graduate Admissions Committee in concert with the student's potential supervisor. Interested students are strongly encouraged to contact potential

supervisors in advance of their application. The Research Overview page of the Department of Physics and Astronomy (<http://physics.uwo.ca/research/index.html>) is an excellent place to start identifying candidate supervisors.

In addition to the above requirements, non-native English speakers must demonstrate their English proficiency.

One option is the [Test of English as a Foreign Language](#) (TOEFL). The minimum acceptable score is 86, with no individual score below 20 for the internet based version, or 550 for the paper and pencil version. [Western's TOEFL ID is 0984].

Another option is the [International English Language Testing Service](#) (IELTS) of the British Council. The minimum acceptable score is 6 out of 9.

For more options see the SGPS web site

([http://grad.uwo.ca/prospective\\_students/applying/admission\\_requirements.html#english](http://grad.uwo.ca/prospective_students/applying/admission_requirements.html#english)).

All graduate courses offered by the Department are in English.

#### A. How to Apply?

All graduate applications must be submitted through Western's online application system:

[http://grad.uwo.ca/prospective\\_students/applying/index.html](http://grad.uwo.ca/prospective_students/applying/index.html).

To apply for admission, a completed application must be submitted, providing the university and the department with the following information:

- [Personal Information](#)
  - We ask for basic information concerning your identity and contact information.
- [Academic History](#)
  - We ask that you supply Western with a listing of all post-secondary schools you have attended.
- [References](#)
  - We will email your referees within 2 hours of entering or updating your reference information. Each reference will be collected by Western and distributed alongside your application once it arrives. No paper reference letters are required.
- [Supplemental Questions](#)
  - Our graduate programs may ask you unique questions that reflect elements of the program you are applying to. The responses you provide are made available to the program during the assessment process.
- [Application Fee Payment](#)
  - Western accepts two methods of payment in order to process your application.
    - Credit Card (Visa/MasterCard)
    - Cheque/Money Order (this must be a money order or bank draft)

issued from a Canadian Banking Institution. Personal cheques will not be accepted.)

- [Supplementary Documents](#)
  - Western makes it possible for you to submit your supporting documents in a digital format. This includes an academic record/transcript from each school you note in your Academic History and any additional documents required by the program you are applying to.
- [Proficiency in English Scores](#), if applicable (You must have the testing service send your score electronically to Western.)

Any enquires about admission requirements should be made to: Brian Davis at bdavis66 [at] uwo.ca (519-661-2111 ext 86639).

The application fee is reimbursed by the department for students accepting an offer.

The tuition and fee schedule can be found at:

[http://www.registrar.uwo.ca/student\\_finances/fees\\_refunds/fee\\_schedules.html](http://www.registrar.uwo.ca/student_finances/fees_refunds/fee_schedules.html)

## 2. ADMINISTRATIVE RESONSIBILITIES AT THE START (Practical Issues)

### A. Western ONECard

The [Western ONECard](#) functions as an identification card for your identity at Western. It is also a library card, meal plan card, and can be used for door access and vending machine purchases.

You may obtain your Western ONECard in the [Student Central Office](#). Please have your Western ID number and one piece of photo identification such as:

- Driver's license
- Citizenship card
- Passport
- Other government issued photo ID

For further details, including important conditions surround use and ownership, please visit [Western ONECard](#).

### B. Obtaining Keys for Physics and Astronomy

1. Building, office, mailroom, copy machine room keys

In order to gain access to the Physics & Astronomy Building and to office rooms as well

as infrastructure rooms (mail room, copy machine room, etc.) you need to contact the Building Manager. He will organize your access via a code to type in at the door or with your Western ONECard.

Phin Perquin, located at the P&A store (P&A28), is the Building Manager.

## 2. Laboratory keys

To receive a key to a laboratory you need request the key on-line. Before you do so contact your supervisor and find out for which room you will need a key. Typically different labs of an individual faculty member have the same cylinder. Therefore only one key might be necessary.

Go to Facilities Management's KeyRequests website.

[http://www.uwo.ca/fm/client\\_services/keys.html](http://www.uwo.ca/fm/client_services/keys.html)

Click on "Sign In".

You will need to login using your Western username and password. Use the drop-down boxes to select the key you need.

1<sup>st</sup> drop down: Faculty/Department: enter PHYSICS/ASTRONOMY

2<sup>nd</sup> drop-down: Building: enter PHYSICS/ASTRONOMY

3<sup>rd</sup> drop-down: Location: enter 023 (for P&A) and then xxx for the room: 023xxx  
(Example for room 234: 023234)

Press "Submit".

Within a few days you will receive an e-mail saying your key is ready to be picked up at the Parking & Visitor Service Office in the Support Service Building – SSB 4150.

When you go to pick up your key(s), make sure you have your Western ONECard with you.

Graduate students do not need to pay a deposit for the keys.

## C. Western Email Account

1. The University provides an [e-mail account](#) to all faculty, staff and students, to be used in conjunction with their duties or activities at the University.

In order to activate your account you will need to go to the [ITS Acceptable Use Policy page](#). You will need to know your Personal Computer Account Login name and password. If you do not know your login name and password, please contact the [Computer Accounts Office](#) and provide your Western ID number to identify yourself. Your account will normally be activated within 2 hours.

2. You must use your Western e-mail account. Staff and faculty may not reply to messages sent from non-Western accounts. Please use your Western email account at all times when communicating with campus staff and faculty.

## D. Parking

[Parking](#) on the Western campus is limited and permits must be purchased by all academic staff, staff and students wishing to park vehicles on campus. Parking permits are transponders that activate electronic gates. This transponder can be obtained from [Western Parking & Visitor Services](#). To obtain your permit, you will need to provide Parking Services with the make/type of vehicle and License plate number as well as your Western ID number. There is a cost to parking.

### 3. ACADEMIC EXPECTATIONS & RESPONSIBILITIES

#### A. Graduate Students

##### 1. General comments on graduate theses

The thesis must contain a scholarly approach to the subject concerned and the student must display a thorough knowledge of the subject during an oral examination (thesis defense). While portions of a thesis may be submitted for publication, the contents of the thesis must represent a unified research project rather than a collection of unrelated projects. Acceptance of portions of the thesis for publication prior to the thesis defense does not mean examiners are obliged to accept the content of the thesis.

##### 2. General comments on graduate reports

The report must contain a scholarly approach to the subject concerned and the student must display a thorough knowledge of the subject. While portions of a thesis may be submitted for publication, the contents of the report must represent a unified research project rather than a collection of unrelated projects. Acceptance of portions of the report for publication prior to the report submission does not mean examiners are obliged to accept the content of the report.

##### 3. Expectations of a Master's student and report

A M.Sc. student must complete research of good scientific quality under the guidance of the supervisor. In the report, the student shall provide the scientific background for the study, frame specific questions or hypotheses, present the results of appropriately designed experimental, observational or theoretical studies, and interpret the findings in relation to the current literature in the field. The results may lead to a publication in a scientific journal. In general, a M.Sc. student shall demonstrate scientific thinking, problem solving ability, scientific communication, and industry.

##### 4. Expectations of a Master's student and thesis

A M.Sc. student must complete research of good scientific quality under the guidance of the supervisor. In the thesis, the student shall provide the scientific background for the study, frame specific questions or hypotheses, present the results of appropriately designed experimental or observational studies, and interpret the findings in relation to the current literature in the field. Ideally, the results will lead to a publication(s) in a scientific journal. In general, a M.Sc. student shall demonstrate scientific thinking, problem solving ability, scientific communication, and

industry.

#### 5. Expectations of a Doctoral student and thesis

A Ph.D. student shall meet all of the expectations of a M.Sc. student with the following extensions of expectation. A Ph.D. student must demonstrate capability of original and independent work. The literature shall be reviewed in greater depth and with careful, critical analysis. The student shall have designed a sophisticated set of experiments or series of observations that will produce a substantial set of results. The interpretation of this set of results shall be critical and thorough, and the thesis should provide a vision for future work that would address unresolved questions raised in the thesis. The thesis research shall be of publishable quality. Ideally, in cases where it is possible, some or all of the thesis research will be published or submitted for publication prior to the defense of the thesis. The general expectations of a Ph.D. student include independence, creativity, originality, critical thinking, problem-solving abilities, scientific communication and industry.

#### 6. Assessment to evaluate whether a student has met the above expectations

Students are assessed formally and informally throughout their progress through the Physics and Astronomy graduate programs, with the major goal of providing feedback and guidance. The most important and obvious formal assessment is the oral defense of the thesis, which occurs at the end of the program. Other formal avenues of assessment include the ACM progress reports and for Ph.D. students the Comprehensive Examination (hereafter referred to as Comprehensive) with its two components. Advisory committee meetings are an important source of less formal assessment and feedback. Additional opportunity for assessment comes from participation in the graduate student seminars, organized separately for Physics and Astronomy. Collectively, these formal and informal assessments help to ensure that a student is prepared for the thesis defense.

### B. Supervisors

- 1) A Supervisor is a faculty member that has the appropriate level of supervisory membership with the School of Graduate and Postdoctoral Studies (SGPS) and carries the primary responsibility for overseeing the student.
- 2) An alternate Supervisor will be appointed by the Graduate Chair in consultation with the supervisor in cases where supervising faculty are no longer employed by Western (e.g., those with a current Casual Academic Appointment, such as emeritus faculty or off-site research adjunct professors).
- 3) Joint Supervisors share the supervision of a student and have the same level of supervisory membership, thus sharing joint responsibility.
- 4) The Supervisor(s) should make and maintain a strong commitment to devote the required time and energy needed to successfully engage in graduate student supervision. As part of this commitment, the supervisor should display the highest ethical standards of behavior at all times.
- 5) Potential Supervisors should have sufficient familiarity with the field of research to provide

appropriate guidance and supervision, or indicate a willingness to gain that familiarity before agreeing to act as supervisor or involve a collaboration partner with the necessary experiences.

- 6) The Supervisor(s) should discuss with the student, very early on, any expectations and the relevant policies concerning authorship on publications, and issues surrounding ownership of intellectual property (this may include patents/licenses). This may result in written agreements or contracts between the supervisor and student covering these issues.
- 7) The Supervisor(s) should make the student aware, very early on, of program requirements and deadlines, various sources of funding, policies covering the conduct of research, and any relevant safety and/or work place regulations. The nature of any financial support provided by the supervisor should be communicated clearly to the student, in writing, including such details as the amount of financial support, the length of time of such support, and any specific conditions pertaining to this financial support. For this purpose the Offer Letter from the Department and the “Financial Support Package” are drafted and handed to the student.
- 8) The Supervisor(s) should, very early on, discuss and formulate with the student a plan of study for completion of degree requirements and thesis work, with clear milestones denoting progress. This would include, for example, assisting the student in selecting and planning a suitable and manageable research project, as well as setting a viable time schedule and adhering to it for thesis progress and completion.
- 9) The Supervisor(s) should be available for regular consultation with the student. The supervisor and student should discuss and agree on an appropriate schedule for supervision meetings, and the supervisor should provide constructive and timely feedback to the student. More generally, the supervisor should maintain open communication and feedback with the student on all issues, including supervisory practices.
- 10) The Supervisor(s) should provide regular evaluations and assessments of the student’s progress and academic performance. This would include a review with the student and the AC, twice a year, of progress on thesis research and any other relevant degree requirements. The supervisor should then provide input to the program regarding the student’s progress.
- 11) The Supervisor(s) should make reasonable arrangements to ensure that adequate and appropriate research resources are available for the student’s thesis project.
- 12) The Supervisor(s) should help ensure that the research environment is safe, healthy, free from harassment, discrimination, and conflict. To this end, the supervisor should be aware of all pertinent regulations and policies covering these issues.
- 13) The Supervisor(s) should provide guidance, instruction, and encouragement regarding the research activities of student. The supervisor should help ensure that the student has access to intellectual resources and research opportunities, and should also encourage the dissemination of research results by publications and conferences.
- 14) The Supervisor(s) should monitor any major discrepancies in advice given to the student by members of the advisory committee and/or supervisor, and attempt to achieve resolution and consensus on the issue(s) involved.
- 15) The Supervisor(s) should be familiar with all program, School of Graduate & Post-Doctoral



Studies, and University policies and procedures pertaining to graduate students and supervision, along with information on graduate student financial support.

- 16) The Supervisor(s) should make satisfactory alternative supervisory arrangements if away for a prolonged period of time.
- 17) The Supervisor(s) should inform the program (i.e., graduate chair or chair), in a timely fashion, of any serious difficulties which may arise in supervision. These might include major professional academic disagreements, interpersonal conflicts, or potential conflict of interest situations.
- 18) Basis of supervision should be based on Western's Graduate Student Best Practices described in the Graduate Supervision Handbook
- 19) [http://grad.uwo.ca/faculty\\_staff/viceprovost/supervision.html](http://grad.uwo.ca/faculty_staff/viceprovost/supervision.html)

### C. Co-Supervisors

Co-Supervisor, definition from SGPS's description:

Co-Supervisor-where two faculty members supervise a student, one of whom has supervisory membership equal to the student, and the other has a level approved to only co-supervise that level of degree.

There are three types of co-supervision: (1) co-supervision in which the co-supervisor is also a collaborator on the student's project (i.e. joint supervision); (2) co-supervision between a new faculty member who holds limited membership in the School of Graduate and Postdoctoral Studies (SGPS) and a more senior member of the department who holds full SGPS membership (i.e. mentoring co-supervision); and (3) co-supervision between an adjunct faculty member and a faculty member of the department who holds full membership. All adjunct faculties wishing to supervise graduate students in Physics or Astronomy must do so with a co-supervisor who is a regular faculty member in the Department.

A Co-Supervisor has the same responsibilities as a regular supervisor with respect to all aspects of graduate student mentoring and progression, with two main differences (compared to "normal" supervision). First, the co-supervisor is not generally involved in day-to-day decision making with respect to data collection, experimental design/trouble shooting or laboratory/research group management in the lab group in which the student is primarily working. (Obviously there are degrees to which this applies, depending on whether a student's project involves work in more than one research group, including that of the co-supervisor.) Second, the co-supervisor generally does not have financial responsibility for the student's stipend.

The Co-Supervisor is meant, in part, to act as an overseer of student progression, making sure that committee meetings are being held regularly, proposal assessments and comprehensive exams (where applicable) are completed on time and, when necessary, provide

guidance/wisdom regarding the appropriateness of student projects and theses (e.g., with respect to their level of difficulty, completeness or suitability for the target degree). Co-supervisors must be aware of and uphold the rules and regulations of the Physics and Astronomy Graduate Programs, especially where they act in this capacity alongside adjunct colleagues who do not hold regular membership in the Department and are not involved in decision making with respect to the Graduate Program.

Finally, Co-Supervisors and named Supervisors are not substitute Supervisors. They do not represent one of two options for attendees at committee meetings, proposal assessments, comprehensive exams or thesis exams. The Co-Supervisor, alongside the named Supervisor, shall be present for all of these important milestones. In the case of a sabbatical or another kind of absence at least one Supervisor should be present.

#### D. Graduate Students Time Away

##### 1. For Research Purposes (Conferences, Field Trips, etc.)

If a grad student is planning a research trip, a conference or any work related event, during the academic year (September 1 through April 30) when the student is responsible for delivering the assigned TA duties, the student is required to obtain permission from:

- the Supervisor(s)
- the Course Instructor(s) for whom the students works on TA assignments
- and written permission from the Graduate Associate Chair. An e-mail is sufficient.
- The student is asked to inform the Graduate Assistant or the Academic Coordinator.

Permission is typically granted when the student has organized a step-in graduate student for the TA tasks to be delivered during the absence.

##### 2. For Private Reasons (Vacation, etc.)

Taken from the School of Graduate and Postdoctoral Studies website:

[http://www.grad.uwo.ca/current\\_students/regulations/4.html](http://www.grad.uwo.ca/current_students/regulations/4.html)

Full-time graduate students are expected to be active in the program for all three terms of the university year, as specified in Section 4.03 of the student regulations of SGPS. In addition to statutory holidays (see Sessional Dates <http://www.westerncalendar.uwo.ca/2013/pg7.html>) and the week-long closing of the University from late December until early January ([https://www.uwo.ca/hr/holiday\\_schedule.html](https://www.uwo.ca/hr/holiday_schedule.html)), normal vacation entitlement is two weeks of vacation during the year, to be scheduled by mutual agreement between graduate student and advisor or supervisor or graduate chair, as appropriate.

##### 3. Short Term Sickness

In the case of a short term sickness the student should inform the supervisor and the course instructor(s) (or the Administrative TA if applicable) of all courses the student has TA duties in as soon as possible with TA details (what, when and where), because the course instructor (or the Administrative TA if applicable) must be able to find an adequate substitute for the student in a timely manner to insure TA duties are taken care of and no course interruptions occur.

##### 4. Long Term Sickness

For long term thickness the University of Western Ontario has rules and regulations which are followed by the Department of Physics and Astronomy. Please see:  
[http://grad.uwo.ca/current\\_students/change\\_status/leave\\_absence.html](http://grad.uwo.ca/current_students/change_status/leave_absence.html)

## 4. DEPARTMENT OF PHYSICS AND ASTRONOMY GRADUATE PROGRAM REGULATIONS

### A. The Advisory Committee

#### 1. Function of the Advisory Committee

- a) The major roles of the Advisory Committee (AC) are to advise the student on matters pertaining to their program of study, and to evaluate student progression.
- b) The Advisory Committee, in consultation with the student and Supervisor(s), can help assigning graduate courses for the student.
- c) The Advisory Committee provides critical evaluation of the package of material planned for inclusion in the student's thesis, and provides a critical checkpoint prior to thesis write- up and submission for examination.
- e) If the Advisory Committee decides a student's progress is unsatisfactory, they will specify what actions are required to remedy the situation and meet again within no more than 8 weeks after the initial meeting. The Supervisor will upload the ACM Report to the student's OWL page and in addition inform the Graduate Chair and/or the Academic Coordinator. The Graduate Chair will inform the student in writing about the disapproving decision of the AC, the requirements and expectations of the student to continue and/or finish the degree.

#### 2. Appointment and Composition of the Advisory Committee

- a) Each student's Advisory Committee will consist of the Supervisor(s) plus two or more additional faculty members, hereafter called "Advisors". At least one Advisor must be a regular or cross-appointed faculty member (not an adjunct) from the Department of Physics and Astronomy
- b) Advisors will be appointed by the Graduate Chair. Once the Advisors have agreed to serve, the student should be informed and the student's page on the OWL with access from all involved (student, Supervisor, co-supervisor, Advisors, Graduate Chair) be created by the Academic Coordinator.
- c) The student or the Supervisor may request that the composition of the Advisory Committee be changed at any time. This change is not necessarily trivial and may result in the need to embark on a new or modified research project especially if the change involves the Supervisor. Time limits to complete the degree are not extended by such a change.

- d) A demand to change the composition of the Advisory Committee should be made in writing to the Graduate Chair.
- e) A student may request a change of Supervisor through the Graduate Chair. The decision by a student to request this change should be taken after exploring all alternatives, ideally through discussion with the Supervisor or, if necessary, through intervention by the university ombudsperson (see <http://www.uwo.ca/ombuds/>).

### 3. Meetings of the Advisory Committee and Forms

- a) A General Advisory Committee will be held during the first full week of classes with all incoming graduate students in the Fall Term and will be mandatory for all incoming students, their supervisors and at least one advisor. It will be organized by the Graduate Chair and the Academic Coordinator. In this meeting a presentation and Q&A (questions and answers) will be given informing in the students on what the expectations towards the degrees, what classes to take, how the Advisory Committee Meeting (ACM) process works, etc.  
Students will get one on one counselling on course selection by his/her supervisor and at least one advisor.
- b) For the first individual ACM the student should post a CV with a photo of themselves on their student OWL page which needs to be updated with each following ACM if necessary (poster/talk on conference, paper submitted, paper published, awards, etc.). The first meeting of the committee will be allowed to run 30 to 50 min. if the Advisory Committee agrees beforehand that they need this time to understand the student's project. An ACM Report with a rough outline of the project must be filled and posted on the student's OWL page by the Supervisor.
- c) The ACM Report form (to be filed by the supervisor) can be found on the OWL webpage. Go to your personal OWL site. Click "More Sites" in the black top bar. There will be various black boxes with white text popping up divided into "Chapters". Under "Projects" scroll down to PhysAstro Advisory Comm... Click on this and then click on Resources, where you will find the newest version of the ACM Report Form in Word or PDF format for download.
- d) Any following ACM will be timed (with a clock!) and kept to 30 minutes. The student is supposed to present his/her progress in the form of a figure or applicable means and verbal explanations. No power point presentations are allowed.
- e) The purpose of an advisory committee meeting is to ensure that the student is making satisfactory progress towards timely completion of their graduate program, including course-work and thesis research, and to use the expertise and experience of the committee members to assist the student in overcoming hurdles on this path. For each ACM, at least 3 workdays in advance of the ACM the student is supposed to upload a Progress Report (see f) onto the student's OWL page stating course work and research status, outlining progress towards completion, and noting any problems encountered that require assistance from the advisory committee or may require substantial changes to

the thesis outline.

- f) The Progress Report form (to be completed by the student), can be found on the OWL website. Go to your personal OWL site. Click “More Site” in the black top bar. There will be various black boxes with white text popping up divided into “Chapters”. Under “Projects” scroll down to “PhysAstro Advisory Comm...”. Click on this, and then click on Resources, where you will find the newest version of the Progress Report Form (Anon\_ProgressReport.pdf). In the same Resources portfolio there is an instruction file available with more information about the ACM and how to fill the Progress Report (ACM Manual.pdf). This ACM manual can also be found at the end of this Handbook in AppendixI.
- g) After the General ACM, the Advisory Committee is required to meet with the student formally at least twice a year: in the Spring Advisory Committee Meeting period typically held in April (the week before and the last week of classes in April) and in the Fall Advisory Committee Meeting period, the two weeks just before Thanksgiving in October. Each meeting results in a new Progress Report form uploaded by the student and a new ACM Report uploaded to the student’s OWL page by the Supervisor.
- h) If an AC member or the student cannot make these times (due to travel, observing, etc.), the AC is allowed to meet anytime later up to 30 days before the Fall ACM period. If an AC member (but not the student) is unable to be present in person for the meeting during the Fall or Spring meeting period, using Skype or a similar video conferencing system is permissible.
- i) In the Advisory Committee meeting held during the term prior to that in which thesis write- up would normally occur, the Advisory Committee will evaluate the completeness of the dataset proposed for the thesis. The Progress Report of the student should contain a Table of Contents, outlining the major topics to be covered in the thesis. The goal of this meeting is to determine whether there is sufficient data to compile a thesis and whether the student has progressed satisfactorily towards completing his/her thesis in the next term. A “Final Term Meeting” report must be posted on the OWL webpage. Potential outcomes of this meeting are:
  - (i) Progress is satisfactory, the project is complete and the student will be able to complete the thesis by the end of the next term. The Advisory Committee will state the completeness and the expectation that the student will complete the thesis within the next term in the ACM Report in the Section “Comments for the student to consider”. They also state that no further ACM is necessary.
  - (ii) Progress is satisfactory, but the student does not have sufficient data for thesis completion within the next term. The Advisory Committee will state the incompleteness in the ACM Report in the Section “Comments for the student to consider”. The Advisory Committee must establish the reasons for the incomplete progress and determine, with the student, a timeline for the timely completion of the project. The student will be expected to complete the project and the thesis

within the timeline established, with funding support from their supervisor according to existing Department policy.

The Supervisor will inform the Graduate Chair and/or the Academic Coordinator about the result of the ACM including reasons and how to proceed or on the expectations of the student to finish the degree.

- (iii) Progress is unsatisfactory. The Advisory Committee will state the unsatisfactory progress in the ACM Report in the Section “Comments for the student to consider”. A follow-up AC meeting must be scheduled. If the project is also incomplete the incompleteness will be stated too. The Advisory Committee must establish the reasons for the incomplete progress and determine, with the student, a timeline for the timely completion of the progress. This may occur in the follow up meeting. The student will be expected to complete the project and the thesis within the timeline established, without guaranteed funding support from their supervisor, according to existing Department policy.

The Supervisor will inform the Graduate Chair and/or the Academic Coordinator about the result of the ACM including reasons and how to proceed or on the expectations of the student to finish the degree.

- j) Additional meetings of the Advisory Committee may be convened at the request of either the student, the supervisor(s), the advisors or the Graduate Chair.
- k) The student is responsible for arranging all individual Advisory Committee Meetings, both time and location. For timing various options exist, e.g. a Doodle; for the location (room reservation in P&A Building) contact the Assistant to the Chair.
- l) The supervisor is responsible for uploading the ACM Report onto the OWL website to both locations (see footnote of ACM Report) within 48 h after the ACM.
- m) If an Advisory Committee meeting has not occurred within the set time, including the extension due to the absence of the student or an AC member, an automatic rating of Unsatisfactory Progress will be stated by the Graduate Chair in written form.
- n) In early April and late September/early October each year, the Academic Coordinator will send an e-mail message reminding students that the next advisory committee period is near. Assessment of whether advisory committees have occurred will begin in the first two weeks of May and November, respectively each year. The Academic Coordinator will examine all student files on the OWL and check which student files have a newly uploaded and dated ACM Report for the period. The Academic Coordinator will inform the Graduate Chair indicating who has not completed this requirement. The Academic Coordinator or the Graduate Chair will contact those who have still not had an advisory committee meeting.
- o) The AC cannot recommend or assign particular TA duties to a student due to his/her weaknesses or strengths. If a student has weaknesses the AC might recommend or highly encourage the student to take a particular undergraduate course to strengthen the

knowledge.

- p) In the case of Unsatisfactory Progress and subsequent removal from the program the student is allowed to stay until the end of the term and will still receive his/her entire funding package until the end of that term.

## B. Satisfying Progression Requirements

Progression through the requirements of the Graduate Programs in Physics or Astronomy is evaluated bi-annually via Advisory Committee Meetings, as well as through the Comprehensive with components 1 and 2, and the thesis. Each of these entities provides an opportunity for the evaluation of the suitability of candidates for the program as well as the likelihood of their successful completion of all program requirements.

Successful completion of the Graduate Programs in Physics or Astronomy requires that students complete all requirements satisfactorily. The consequences of poor performance in the Comprehensive are outlined below. However, continuance in the program also requires satisfactory progress in research as well as a demonstrated familiarity with the subject of the research. These two criteria are evaluated by the Advisory Committee twice a year in the AC meetings.

When, as a result of the outcome of an Advisory Committee meeting, student progress is evaluated to be “Unsatisfactory”, the student is expected to make improvements (with appropriate guidance from their supervisor(s) and advisors), as demonstrated in a follow up meeting held within a period of no more than 8 weeks after the “Unsatisfactory” meeting. A second evaluation of “Unsatisfactory” may result in the student being withdrawn from the program.

## C. Course Requirements

The courses for Physics or Astronomy students are chosen via a form available from the Graduate Affairs Assistant in the Main Office. It needs to be completed and signed by the student and the supervisor and returned to the Graduate Affairs Assistant. The Graduate Affairs Assistant will register the student in the chosen courses with the university. The add-drop deadline for all graduate courses is at the end of the first week the course is taught.

Undergraduate courses can be taken for credit by graduate students as long as they make up no more than 1/3 of the graduate degree course requirements.

All course selections must be discussed with and approved by the student’s Advisory Committee. It is within the power of the Advisory Committee to require extra coursework beyond the minimal requirements below.

All MSc students and PhD students in their first two years of study must enroll in and successfully complete the fall and winter terms of the Physics and Astronomy Graduate Seminar.

**MSc Physics:** Students are required to complete 3.0 HCE (half-course equivalents); at least 2.0 HCE must come from courses offered by the Physics and Astronomy Department.

**Phd Physics:** Students are required to complete 3.0 HCE; at least 2.0 HCE must come from courses offered by the Physics and Astronomy Department.

**MSc Astronomy:** Students are required to complete 3.0 HCE which must include the 1.0 HCE course Astronomy 9610 “Fundamentals of Astrophysics;” there are no exceptions to the MSc requirement of Astronomy 9610. Of the remaining 2.0 HCE, at least 1.0 of these HCE must come from courses offered by the Physics and Astronomy Department. Note that most astronomy graduate course offerings are quarter courses, each of which counts as 0.5 HCE.

**PhD Astronomy:** Students are required to complete 2.0 HCE; at least 1.0 HCE must come from courses offered by the Physics and Astronomy Department

## E. Continuous Registration and Maximum Registration Period

Graduate students must maintain continuous registration in the School of Graduate & Post-Doctoral Studies, either full-time or part-time, in each successive term from initial registration until the end of the term in which all requirements for the degree are completed.

Interruptions in continuous registration (e.g. Leave of Absence) or changes in status (e.g., full-time to part-time) must be requested through the Physics and Astronomy Graduate Affairs Committee. Final approval must come from the School of Graduate & Post-Doctoral Studies.

Normally, degree programs are completed within a period not exceeding two calendar years (six terms) from initial registration in the case of the M.Sc. degree (if registered full-time), and four calendar years (12 terms) from initial registration in the case of a Ph.D. degree (if registered full-time). For students who transfer from a M.Sc. program to a Ph.D. program without completing the M.Sc. program, a maximum of five calendar years (15 terms) from the initial registration in the M.Sc. program will be given to complete the Ph.D. degree (if registered full-time).

## F. Financial Responsibilities of the Department and the Supervisor

For graduate students who do not receive sufficient external funding (e.g. NSERC, OGS or other major external, Canadian or International scholarships) the Department and the Supervisor undertake to provide financial support throughout the period of funding eligibility. This corresponds to 2 years (six terms) for M.Sc. candidates, 4 years (12 terms) for Ph.D. candidates, and 5 years (15 terms) for students that transfer from the M.Sc. to the Ph.D. program. Part of this support is provided in the form of a Graduate Teaching Assistantship. Such Teaching Assistantships are typically held during the fall and winter terms, although a few summer



Assistantships are available each year. Students who maintain a minimum mark average of 70% (or as dictated by the SGPS), are eligible for a Western Graduate Research Scholarship (WGRS).

Finally, students are provided with a Research Assistantship, paid out of funds from the supervisor(s). These three entities allow the student to pay tuition and ancillary fees and possibly other charges, as well as to have a regular monthly income over the entire academic year. Eligibility for funding beyond the outlined timelines for each degree is not guaranteed.

## G. Financial Responsibilities of the Student

The student will be responsible for paying all tuition and ancillary fees, normally in three installments per year and maybe Late Payment Penalties and /or Deferment Charges, Registration Changes, etc. The Fee Schedule can be found on the UWO Registrar's website at [http://www.registrar.uwo.ca/student\\_finances/fees\\_refunds/refund\\_schedules.html](http://www.registrar.uwo.ca/student_finances/fees_refunds/refund_schedules.html). In addition, part of the funds are subject to income tax and benefits deducted by the university.

Please see

[http://grad.uwo.ca/faculty\\_staff/financial\\_support/compensation.html](http://grad.uwo.ca/faculty_staff/financial_support/compensation.html) and <http://www.uwo.ca/hr/benefits/leave/gta.html>.

Each student has a Tuition Account with the University of Western Ontario. The WGRS amount of the salary is paid directly to the student's Tuition Account. However, WGRS does not cover the entire tuitions and the ancillary fees. The student needs to pay the difference. Currently the Tuition Account payments are due the first week of the term. However, the salary is paid at the end of each months. Therefore, students are highly encouraged to make financial arrangements beforehand.

The Faculty of Science is in negotiations with the University to change this initial financial hurdle. Students new to London may also face financial hurdles due to double rent at the beginning of a rent period, double utility bills, and double telephone and internet charges. Financial preparation for these startup costs would be beneficial to incoming students.

## H. Extensions to Degree Completion Time

Students who require longer than the maximum registration time to complete their degree program do so without a guarantee of financial support from the department or their supervisor. Students requiring longer than the maximum time must have an Advisory Committee meeting within four months of the maximum registration date. The Advisory Committee meeting must indicate that the student is making satisfactory progress, provide a detailed timeline for completion. The supervisor consults with the Graduate Chair on the possibilities of a continuation of the student's funding.

## I. Appeals

An appeal is a request for exemption from a Departmental or Senate regulation on compassionate or medical grounds or because of extenuating circumstances; or a request that a grade on a particular piece of work or a final standing in a course or program be changed.

Conflicts should be resolved at the lowest level possible. For graduate students, the successive levels for an appeal are:

- \* Course Instructor (if applicable) or Chair of Reading Committee or Supervisor (depending on the issue)
- \* Graduate Chair
- \* Chair
- \* Provost of the School of Graduate & Post-Doctoral Studies
- \* Senate Review Board Academic (SRBA)

Appeals relating to a specific course (e.g., against a mark, grade, appropriateness of assignments or examinations, or grading practices) must be initiated with the appropriate course instructor.

Appeals on other matters (e.g. Comprehensive Exam Part I and II or mark of a Research Report) should be initiated in the office having immediate jurisdiction on the particular requirement or regulation in question (e.g. the Graduate Chair). Students in doubt as to the appropriate level at which appeals should be initiated should consult the Graduate Chair.

The initial step of the appeals procedure should be completed as soon as possible but no later than six weeks from the date of action of the decision giving rise to the appeal. It is, therefore, the responsibility of the student to initiate an appeal at the earliest possible opportunity and for the university officer concerned to act upon the request as expeditiously as possible.

Legal counsel is not permitted below the level of the SRBA. However, the appellant does have the right to be accompanied by a colleague.

In the case of an appeal relating to a specific course:

- 1) A resolution of the problem should first be attempted through informal consultation with the instructor. If the instructor will not meet, or will not be physically available within a reasonable time period, the appeal may be forwarded directly to the Graduate Chair.
- 2) If the student is dissatisfied with the decision made by the instructor, a written statement of appeal may be made to the Graduate Chair within three weeks of the date of the previous decision. The written request need not be lengthy but should indicate clearly the details of the appeal and the relief requested. The Graduate Chair, within three weeks of the receipt of the formal appeal, will call a meeting of an Ad-Hoc Committee of Appeal (AHCA). This committee will consist of at least the following:
  - \* The Graduate Chair
  - \* One member of the Physics and Astronomy Graduate Affairs Committee, who is also a member of the School of Graduate & Post-Doctoral Studies and who is not the instructor being challenged
  - \* A P&A graduate student member of or appointed by the Graduate Council of Physics and Astronomy

The AHCA may ask other persons concerned to appear at the meeting.

Note: If the complaint is against the Graduate Chair, the Department Chair or designate will act in the Graduate Chair's place.

The Graduate Chair, on behalf of the AHCA, will notify the appellant and course instructor, in writing, of the committee's decisions and recommendations (including reasons for the decision) within one week of the meeting.

- 3) Following an appeal to the Graduate Chair, the student, if not satisfied with the decision of the committee, may then appeal to the Provost of the School of Graduate & Post-Doctoral Studies. (See School of Graduate & Post-Doctoral Studies, General Information, Section I, Petitions and Appeals.)

In the case of an appeal that is a request for exemption from a Departmental regulation, the procedures are the same except that the process begins with informal consultation with the Graduate Chair.

For appeals of decisions made by M.Sc. assessment/report or thesis examining committees and Ph.D. assessment/comprehensive exam/reading committees, an oral or written statement of appeal (depending on the seriousness of the issue) may be made to the Graduate Chair with three weeks of the date of the previous decision. In minor cases, the Graduate Chair tries to resolve the issue consulting with the involved faculty members and, if necessary, a neutral but particular subject knowledgeable faculty member. In more severe cases, the Graduate Chair, within three weeks of the receipt of the formal appeal, will call a meeting of an Ad-Hoc Committee which will consist of at least the following:

- \* The Graduate Chair
- \* The Department Chair
- \* The Supervisor
- \* Two members of the Physics and Astronomy Graduate Affairs Committee who have membership in the School of Graduate & Post-Doctoral Studies and who were not involved in the original deliberations
- \* A P&A graduate student member of or appointed by the Graduate Council of Physics and Astronomy

The Graduate Chair, on behalf of the Committee, will notify the appellant, in writing, of the committee's decision within one week of the meeting. If not satisfied with the decision of the Ad- Hoc Committee, the student may then appeal to the Provost of the School of Graduate & Post- Doctoral Studies.

## 5. PRICES/AWARDS/SCHOLARSHIPS, YEAR-X FUNDING

There are a variety of external (not from UWO) awards and scholarships available for domestic and international students. In addition, the Department of Physics and Astronomy has two awards/scholarships available for physics and astronomy students.

#### A. Lillian Margaret & Walter David Jackson Scholarship in Physics

This donor award has a value of \$3000 and is to be awarded to one student each year. It may not be in conjunction with their RA income. The award funds will be awarded to the student through their Tuition account.

#### B. The Wehlau Award

This donor award has a typical value of ~\$1700 and is to be awarded to one student each year. It may not be in conjunction with their RA income. The award funds will be awarded to the student directly by a check.

The Graduate Chair informs the faculty of the department about the availability of these scholarships/awards via e-mail and asks for nominations and the reasoning for the nomination, and sets a nomination deadline. After the nomination deadline the Graduate Affairs Committee, decides on the awardee according to the information given by the supervisor(s) on the nominated students. In the case of a tie situation, the Graduate Chair involves additional expert faculty to name a winner.

#### C. Faculty of Science Incentive Scholarship directly to excellent incoming domestic students

The faculty of Science offers Incentive Scholarships for exceptional domestic students at the start of their Master or Ph.D. program. The applications for these Scholarships need to be filed by the supervisor to the Graduate Chair who funnels them to the Dean's Office of the Faculty of Science. The Faculty decides on the scholarships, informs the Graduate Chair about the awardee who then informs the supervisor and the awardee.

##### a. Master Incentive Scholarship

This scholarship has a value of \$2500 and is awarded to the student via his/her Annual Financial Support Package. It may not be in conjunction with their RA income.

##### b. Ph.D. Incentive Scholarship

This award has a value of \$8000 per year for two years and is awarded to the student via his/her Annual Financial Support Package. It may not be in conjunction with their RA income.

#### D. Faculty of Science Scholarships in conjunction with RA income

The Faculty offers grants towards the supervisor for two years for new incoming domestic students for those supervisors who are currently training 4 or more students, not including year-x (see G.), where no additional funding from research grants is available to hire an additional student. The application for this scholarship needs to be filed by the supervisor to the Graduate Chair who funnels it to the Dean's Office of the Faculty of Science. The Faculty decides on the scholarship and informs the Graduate

Chair who informs the supervisor.

#### E. Major Awards and Scholarships: NSERC, OGS, Queen Elisabeth II, Trillium, Vanier, etc.

These are external scholarships. Domestic students are highly encouraged to apply for these prestigious awards (NSERC, OGS, QEII). Trillium and Vanier are awards for international students. The nomination needs to be done by the supervisor along with the Graduate Chair and the Dean's Office of the Faculty of Science.

#### F. Teaching Assistantship (TA) and Scholarship

Students with a prize, award or direct scholarship who are awarded an amount of larger than \$5000 per term for more than one term get an assignment of half a TA-ship (70 hours/term) for the duration of the award/scholarship. Students with prizes, awards or direct scholarships who are awarded an amount of smaller or equal to \$5000 per term for more than one term, may discuss with their supervisor(s) on the number of hours, half (70 hours/term) or full (140 hours/term) TA-ship, they will be expected to assume.

#### G. Year-X Scholarships

Students who are beyond their funding period of 6, 12 or 15 terms for Master, Ph.D. or Master to Ph.D-transfer students, respectively, are called year-x (or beyond funding) students. They are no longer eligible for WGRS.

However, all year-x students can get, however cannot be guaranteed, additional terms of a full or half TA (GTA Collective Agreement) after the TA position has been advertised for 2 weeks on the SGPS's homepage.

In addition, the Faculty of Science offers a scholarship for domestic PhD year x-students towards the supervisor. For the first additional term \$7000 and for the second additional term \$2000 can be awarded. The supervisor needs to apply for this year-x student funding to the Graduate Chair who funnels it to the Dean's Office of the Faculty of Science. The Faculty decides via a committee on the scholarships and informs the Graduate Chair who informs the supervisor.

Despite these possibilities any funding beyond the regular funding period of 6, 12 or 15 terms for Ph.D. or Master to Ph.D-transfer students, respectively, is not guaranteed.

## 6. TEACHING ASSISTANTSHIP (TA)

### A. TA Assistantship

Each fundable graduate student is eligible for a full (140 hours) or half (70 hours) TA position during the fall and winter terms. The TA position remuneration is an important part of the student income.

TA assignments are ascribed by the TA Coordination Committee in consultation with the course supervisor(s) and the students. The TA Coordination Committee is composed of the Undergraduate Chair, the Graduate Chair, the Academic Coordinator or the Graduate Affairs Assistant and the Laboratory Coordinator.

The TA positions are assigned with respect to the abilities of a particular student to understand and teach the course material. This ensures course quality.

The students should not TA more than 10 hours per week on average (Ministry regulation).

TA positions should not be used to force a student to gain further understanding in a particular field where fundamental knowledge is missing. A graduate student, who is weak in a particular area, should not TA a course in that particular discipline, but should instead be encouraged to audit a course in the subject area where weaknesses exist and do all required assignments and exams.

The TA position is a unionized employment situation. The students should familiarize with the TA-Collective agreement:

([http://www.uwo.ca/hr/form\\_doc/employee\\_agreements/gta.pdf](http://www.uwo.ca/hr/form_doc/employee_agreements/gta.pdf)) about rules and regulations. In particular attention is drawn to Articles 15 and 16 when expectations are not met.

## B. Graduate Student Teaching Assistantship Guidelines

### (1) The Role of the Teaching Assistant

The role of the Teaching Assistant is to assist the instructor in delivering a high quality course and to enhance the learning experience of the students in the course. Being a Teaching Assistant is a valuable part of the graduate experience that can help students develop many complementary professional skills that will enhance the academic and research skills they develop in the program. The TA experience should be about teaching, which means the TA must have mastery of the academic material at a level significantly above the abilities of the students in the class. TAs are encouraged to ask for guidance and feedback from Instructors, fellow TAs and students (e.g., sitting in on tutorials, checking marking, giving interim evaluations) to improve their teaching skills.

### (2) The Role of the Instructor

The role of the Instructor is to deliver a high quality course to the students. The Instructor is ultimately responsible for the content and delivery of the curriculum, the construction of exams and assignments, and the fairness and consistency of marks. The Instructor also has a supervisory role to the TA, and should provide explicit teaching guidance as appropriate. For example, TAs may request feedback on tutorial delivery, marking practices, etc.

(3) Priority of TA Assignment (undergraduate and graduate courses):  
In order to allocate available TA hours effectively and assign TAs for courses in the Department of Physics & Astronomy according to their abilities and experience, a priority list for TA allocation is given below.

- (a) First priority: Large courses with a laboratory/project component  
Large courses (enrolment  $> 100$ ) with laboratory/project component have the greatest need for TAs because of the logistics of dealing with a large number of students including providing tutorials, monitoring laboratories and grading exams, lab reports and project reports.
- (b) Second priority: (i) Large courses without a laboratory component  
(ii) Moderate and small courses with a lab component (safety requirements in the lab component)
- (c) Third Priority: Moderate sized courses ( $25 < \text{enrolment} < 100$ )
- (d) Fourth priority: Small courses (enrolment  $< 25$ )  
Small undergraduate courses are not automatically guaranteed a TA, however, a request can be made to the TA Coordinator with an explanation of why a TA is required. If TAs are available they will be assigned based on the course enrolment, the difficulty level of the course and the need for undergraduate student support.

Please note that in general graduate courses will not obtain TA support unless enrolment is sufficiently high. An instructor who feels they require a TA for a graduate course must get permission from the Graduate Chair. A TA in a graduate course must have passed the PhD Comprehensive Examination. It is the Instructor's responsibility to ensure that all marking for graduate courses with a TA is anonymous, so that the identity of the graduate student being marked is hidden from the TA.

(4) Assignment of TA hours

The number of available TA hours needs to be distributed among the priority categories in order to enhance student learning impact, and not necessarily to save time for Instructors.

- (a) For the large classes, each tutorial section needs 70 hours of TA including tutorial preparation, marking and proctoring.
- (b) For the First Year Lab, each lab sub-section (each lab room) needs two TAs, one as a 'marker' and the other as a 'helper'. The total TA hours needed for the lab depends on the total enrolment in all first year physics courses.
- (c) Upper year courses with a small enrolment (enrolment  $< 20$ ) will typically be assigned 70 TA hours, although the Instructor should inform the Grad Chair if a  $\frac{1}{4}$

TA (35 hours) is more appropriate. A request for up to 140 h must be made to the Graduate Chair (within one month after Instructor teaching assignments have been made). More TA hours are allocated for courses with a lab component (due to safety requirements of running a lab).

- (d) At the request of the instructor, an Administrative TA will be available for large courses. The Admin TA will typically be assigned 70 TA hours, although up to 140 TA hours will be possible if authorized by the Graduate Chair.
- (e) All approved special TA requests for September (Fall term) must be communicated by the instructor to the TA coordinator by the first week of July. For the Winter term the requests need to be communicated by the first week of November.

#### (5) Assignment of TAs

The TA assignments are carried out by the TA Assignment Committee. This committee includes the Undergraduate Chair, the Graduate Chair, and the Graduate Assistant. The Committee takes the following items into consideration when assigning TAs.

- (a) Consulting the course Instructor to decide the required number of TAs and their hours.
- (b) Taking into account the current and past enrolment figures in the course in addition to past TA allocation for the course.
- (c) Special requests from course Instructors for a particular TA for the course.
- (d) Special requests from TAs to work with a particular Instructor/course.
- (e) Abilities of the TAs in the subject matter of the course, language skills, teaching skills, and social skills.
- (f) Special accommodations for the TA (e.g., medical, absences for a long period, travelling required for completion of the thesis, etc.).

Typically, upper-year undergraduate courses are given to more experienced PhD-level students who have already passed the Comprehensive Examination. Under no circumstances should a TA be given to a student so they can “learn the course material”, e.g., as remedial work for a poor performance in a subject area; it is more appropriate for them to be a student in the course in this case.

Proctoring exams in courses other than the one(s) to which a TA is assigned is common. TAs will be given at least 48 hours’ notice of proctoring duties.

#### (6) Monitoring of TA hours by the TA and Instructor

The TA must monitor their hours and give regular feedback to the course Instructor (or the Administrative TA if applicable) on how many hours have been used. If the TA uses up all assigned TA hours before the end of the term, the Department may not be able to provide more TA hours for the course. In this case, the responsibilities of the TA defer to the course Instructor.

In some cases, the number of hours assigned to the TA are insufficient for the duties assigned to the TA by the Instructor. The following procedure will be used for resolving this situation.



- (a) If and when it becomes apparent to the TA or the Instructor that the required hours to perform the expected duties of the TA are greater than the allocated hours, the first step is for the TA and the Instructor to have an in-person conversation about modifying the expected duties and/or the practice of the TA (in the cases where the TA is spending too much time on a given activity).
- (b) If following this meeting the situation is not resolved to the satisfaction of either the TA or the Instructor, one of them must contact the Graduate Chair or the Department Chair to resolve the dispute as soon as possible.

## 7. GRADUATE STUDENT ETHICS CODE

Definition of Ethics: “moral principles that govern a person's or group's behavior” [New Oxford American Dictionary]

Graduate students in the Department of Physics and Astronomy are students in training to become professional scientists. As such, they are expected to adhere to the highest standards of ethical behaviour in scientific research. These standards include performing research in a rigorous, transparent and reproducible manner; properly acknowledging sources and contributors; and avoiding conflicts of interest. Both the [Canadian Astronomical Society](#) and the [Canadian Association of Physicists](#) have available statements further explaining these standards. Violation of scientific ethical standards or [University Scholastic Offenses](#), including plagiarism and cheating, carry a range of penalties up to and including expulsion from the University.

Graduate students in the Department of Physics and Astronomy are supported by public funds, and students have a responsibility to make sure those funds are used properly. This responsibility includes ensuring that expense claims are correct, and that research facilities and resources (including computing/IT resources) are used for research and not personal purposes. One of the most important resources is the students' own time. While research is usually flexible in terms of when and where graduate students work, students are expected to spend a minimum of 40 hours per week on their studies, teaching assistantships, and research. Graduate students are entitled to University specified holidays and vacation guidelines, however, the undergraduate exam periods are not vacation time and students must remain available for teaching and research duties unless they have prior written consent of the Graduate Chair.

Graduate students in the Department of Physics and Astronomy are usually employed as teaching assistants (TAs). This is an important role with substantial responsibilities, and graduate students must take these seriously. Where teaching assistant duties conflict with research activities (e.g. lab work, field work, telescope observing time, conferences, etc.), TAs must discuss arrangements for absences or rescheduling with the professor supervising their TA duties at the beginning of term. For absences from campus, TAs must also receive written permission from the Graduate Chair (see also TIME AWAY).

Teaching Assistants must treat all students equally, with respect and fairness, regardless of race, colour, age, religion, national origin, sexual orientation, sex, marital status, or disability. TAs

must avoid sexual harassment, defined as “any verbal or physical conduct of a sexual nature that is known (or should reasonably be known) to be unwelcome”.

They must also avoid conflicts of interest by not developing personal relationships with or accepting gifts from their students, and protect the confidentiality of student grades and student numbers. The Department of Computer Science’s TA Handbook (<http://www.csd.uwo.ca/~ajja/TAHandbook.htm>) has more detailed information on Professional Ethics for TAs.

If There are any questions about what an ethical course of action is for a particular work situation please do not hesitate to ask the Graduate Chair or any member of the Graduate Affairs Committee.

## 8. STIPEND – UNDERSTANDING GRADUATE STUDENT PAY

Each student receives an Annual Financial Support Package in the beginning of September which indicates how the stipend is composed.

### A. Canadian Students and Students with a Permanent Resident Status

The Faculty of Science and the Department of Physics and Astronomy provide financial support to outstanding domestic graduate students. As part of this commitment they are pleased to offer a financial support package of a minimum of \$18,741 per year for domestic students, which is comprised of funding equivalent to the cost of tuition \$6,741 (in 2015-2016) plus \$12,000 per year conditional on meeting the Physics and Astronomy Department’s conditions for progression towards the degree. This funding package may include support funding from the supervisor’s research grant, external scholarship support (such as SSHRC, NSERC, CIHR, OTS, OGS, QEII, etc.), a Graduate Teaching Assistantship ( please see: [http://www.grad.uwo.ca/faculty\\_staff/financial\\_support/teaching\\_assistantships.html](http://www.grad.uwo.ca/faculty_staff/financial_support/teaching_assistantships.html)), internal scholarship support (such as Western Graduate Research Scholarships (WGRS), program- based scholarships, endowments, etc.), and employment other than a Graduate Teaching Assistantship.

This financial support is paid at various times throughout the yearintotwoaccounts: thestudent’s UWO Tuition Accountandthestudent’spersonalbankaccount. While the stipend is enough to cover tuition and living expenses here in London, the timing of the payments can create some cash-flow difficulties, particularly if one fails to save and plan. For instance the tuition and ancillary fees are due for the Fall Terms:

First Installment: Early September

Second Installment: Middle of

October

Example: Domestic students without External Scholarship

Fall Term / Winter Term: (assumes a full TA appointment in each term)

Funding Source	Amount and Installation
----------------	-------------------------

TA	\$6349.63 payed monthly
RA	\$2012
WGRS	\$700 payed as lump sum directly into tuition account
Total	\$9061.63

At the very beginning of the fall term, the student will owe tuition and ancillary fees of \$3111.80 (February 2016), possibly creating a potential cash-flow problem. The program will put \$700 into the student's tuition account, but the student will immediately be charged \$3111.80 for tuition and ancillary fees. In the academic year 2015-2016 the Department of Physics and Astronomy offers to install (with feed-back from the student) the entire RA part of the salary in mid-September to allow the student to pay at least half of the tuitions and fees. Be aware that the salary is taxed and you need to pay TA union fee.

Summer Term: (assumes no summer TA)

Funding Source	Amount and Installation
TA	
RA	\$7072
WGRS	\$800 payed as lump sum directly into tuition account
Total	\$7872

Note that the summer stipend is less than the Fall & Winter stipends ( $(\$7072)/4 = \$1768$ ). The difference is the non TA employment over the summer term.

At the very beginning of the summer, the student will owe tuition and ancillary fees of \$3111.80 (February 2016), possibly creating a potential cash-flow problem. The program will put \$800 into the student's tuition account, but the student will immediately be charged \$3111.80 for tuition and ancillary fees. In the academic year 2015-2016 the Department of Physics and Astronomy offers to install (with feed-back from the student) the entire RA part of the salary in mid-May to allow the student to pay tuitions and fees.

Example: Domestic students with NSERC Scholarship

Fall Term / Winter Term: (assumes a full TA appointment in each term)

Funding Source	Amount and Installation
TA	\$3174.82 payed monthly
RA	
WGRS	\$700 payed as lump sum directly into tuition account
NSERC	\$7000 payed monthly
Total	\$10,874.82

At the very beginning of the fall term, the student will owe tuition and ancillary fees of \$3111.80 (February 2016), possibly creating a potential cash-flow problem. The program will put \$700 into the student's tuition account, but the student will immediately be charged

\$3002.10 for tuition and ancillary fees.

Be aware that the salary is taxed and you need to pay TA union fee.

Summer Term: (assumes no summer TA)

Funding Source	Amount and Installation
TA	
RA	
WGRS	\$800
NSERC	\$7000
TA (“onetime payment”)	
Total	\$7800

Note that the summer stipend is less than the Fall & Winter stipends. The difference is the non TA employment over the summer term.

At the very beginning of the summer, the student will owe tuition and ancillary fees of \$3002.10 (August 2014), possibly creating a potential cash-flow problem. The program will put \$800 into the student’s tuition account, but the student will immediately be charged \$311.80 for tuition and ancillary fees. Be aware that the salary is taxed and you need to pay TA union fee.

## B. International Students

The Faculty of Science and the Department of Physics and Astronomy provide financial support to outstanding international graduate students. As part of this commitment they are pleased to offer a financial support package of a minimum of \$28,612 per year for an international student, which is comprised of funding equivalent to the cost of tuition \$16,612 (2015-2016) plus \$12,000 per year conditional on meeting the Physics and Astronomy Department’s conditions for progression towards the degree. This funding package may include support funding from the supervisor’s research grant, external scholarship support (such as SSHRC, NSERC, CIHR, OTS, OGS, QEII, etc.), a Graduate Teaching Assistantship ( please see: [http://www.grad.uwo.ca/faculty\\_staff/financial\\_support/teaching\\_assistantships.html](http://www.grad.uwo.ca/faculty_staff/financial_support/teaching_assistantships.html)), internal scholarship support (such as Western Graduate Research Scholarships (WGRS), program- based scholarships, endowments, etc.), and employment other than a Graduate Teaching Assistantship.

This financial support is paid at various times throughout the year into two accounts: the student’s UWO Tuition Account and the student’s personal bank account. While the stipend is enough to cover tuition and living expenses here in London, the timing of the payments can create some cash-flow difficulties, particularly if one fails to save and plan. For instance, the tuition and ancillary fees are due:

First Installment: Early September

Second Installment: Middle of October

Example: International student without External Scholarship

Fall Term / Winter Term: (assumes a full TA appointment in each term)

Funding Source	Amount and Installation
TA	\$6349.63 paid monthly
RA	\$2166
WGRS	\$3533 paid as lump sum into tuition account
Total	\$12,048.63

At the very beginning of the fall term, the student will owe tuition and ancillary fees of \$6277.81 (February 2016), possibly creating a potential cash-flow problem. The program will put \$3533 into the student's tuition account, but the student will immediately be charged

\$6277.81 for tuition and ancillary fees. In the academic year 2015-2016 the Department of Physics and Astronomy offers to install (with feed-back from the student) the entire RA part of the salary in mid-September to allow the student to pay tuitions and fees.

Be aware that the salary is taxed and you need to pay TA union fee.

Summer Term: (assumes no summer TA)

Funding Source	Amount and Installation
TA	
RA	\$6072
WGRS	\$4244 paid as lump sum into tuition account
Total	\$10,316

Note that the summer stipend is less than the Fall & Winter stipends. The difference is the non TA employment over the summer term.

At the very beginning of the summer, the student will owe tuition and ancillary fees of \$6277.81 (February 2016), possibly creating a potential cash-flow problem. The program will put \$4244 into the student's tuition account, but the student will immediately be charged \$6277.81 for tuition and ancillary fees. In the academic year 2015-2016 the Department of Physics and Astronomy offers to install (with feed-back from the student) the entire RA part of the salary in mid-September to allow the student to pay tuitions and fees. Be aware that the salary is taxed and you need to pay TA union fee.

## 9. PHYSICS 9001- COMPREHENSIVE PHYSICS

Physics 9001, the Physics' Comprehensive Examination, (in short Comprehensive) is a requirement which must be fulfilled by all graduate students in the Physics' Ph.D. program. Successful completion of this required Comprehensive Examination appears on the transcript as a pass for the 9001 course.

**Purpose:** The Physics Comprehensive allows Ph.D. candidates in Physics at Western to demonstrate early in their tenure that they have mastered an adequate level of general knowledge in fundamental physics and are adequately prepared to pursue their Ph.D. research work in their chosen subfield. This mastery must be at a level to suggest that they will be able to successfully complete and defend their thesis in an acceptable period of time.

**Format:** The Comprehensive consists of two components: Component (1), the written tests and final exam of the graduate course Physics 9610 "Foundations of Physics" to test background knowledge and adequate problem-solving ability, and Component (2), a Research Proposal or a Review Paper written by the student and focused on their PhD research topic. The material of the student's Research Proposal or Literature Review Paper forms the basis of an oral exam. The student's AC decides on the appropriate form (Research Proposal or Literature Review Paper) of the written component 2.

**Timing:** Entering PhD students must enroll in Physics 9610 to take the tests and exams of the course at the first available fall offering. The written Research Proposal or Literature Review Paper is to be completed during the winter term immediately following the completion of Physics 9610. Deviations from these guidelines may be considered by the Ph.D. student's Advisory Committee in special cases.

### Physics Comprehensive Component 1: Written Examination

**Format:** The student must complete all tests and the final exam of the course Physics 9610 "Foundations of Physics". This may be done within the context of taking the course for graduate credit; however, sufficiently prepared students (MSc students transferring into the PhD program or PhD students who have successfully taken the Physics Program's 3 core courses (Quantum Physics (P9203), Classical Electrodynamics (9302), Statistical Physics (Physics 9404)) during their Master studies) may simply choose to write the tests and the final examination without enrolling in the course and without attending lectures. (If these sufficiently prepared students choose to enroll in Physics 9610 it does not count towards their PhD program's course requirements.) For the purpose of the Comprehensive, there is no requirement to complete the course problem sets.

**Content:** The subject areas of Physics 9610 "Foundations of Physics" are Electricity, Magnetism, Classical Mechanics, Quantum Mechanics, Statistical Mechanics and Thermodynamics.

**Marking and Outcome:** To pass Component (1), the student must obtain a mark of 80% or higher on the weighted-average over all of the tests and the final exam of Physics 9610. Missed tests must be made up and cannot be accommodated by re-weighting a partially completed set

of tests and exam.

Exemption from Final Examination: 1. Students with averages greater than 80% and with no single test less than 70% are deemed to have passed Compressive (1) and are exempted from writing the final examination. 2. If students take the final examination, then the weighted average of 60% of the four tests (treated equally) plus 40% of the final examination results must be greater or equal to 80%.

Students who meet this standard are deemed to have passed Component (1) and move on to Component (2), the written research proposal, in their next term of study. Students who receive a grade of below 80% have failed Component (1). Such students may be invited by their Advisory Committee to take a make-up exam during the April final examination period. The reference material for this make-up exam will be identical to the course offering. Such students will also proceed to Component (2) in the term immediately after their unsuccessful attempt of Component (1). A student who is not invited by their Advisory Committee to take the April make-up is deemed to have failed the Physics Comprehensive Examination and must leave the program. Finally, students who receive 59% or less are typically not approved by their ACM committee to take the April make-up.

Pre-Qualification by MSc Students: MSc students who complete Physics 9610 with a grade of 80% or higher (weighted-grade over tests and examination) are deemed “pre-qualified” for Component (1) of the Physics Comprehensive Exam. If they move on to PhD studies, they receive an automatic pass on Component (1) and can move straight to Component (2).

Exam Review: Each student has the right to view his or her tests, and the exam to check for accuracy in marking and to review any missed questions. This review is to be done at a single meeting in the presence of the student’s supervisor or designate. The exam cannot be photocopied and no written notes of the exam questions can be taken at this review. Any problems with the exam marking should be immediately brought to the attention of the Graduate Chair.

#### Physics Comprehensive Component 2: Research Proposal or Written Literature Review Paper with Oral Defence

Committee: Each student will be assigned a Reading Committee nominated by the Department’s Graduate Chair. The Reading Committee will consist of three faculty members, at least two of whom are not supervising the student, and who have graduate supervisory privileges in the Physics program. It can be the Advisory Committee. Exceptions to this rule will be considered at the discretion of the Graduate Chair and the student’s supervisor(s). The student’s supervisor will be the Chair of the Reading Committee. This Chair organizes the oral exam and communicates all results about the Research Proposal or the Literature Review Paper and the oral exam to the Graduate Chair. It is the task of the Reading Committee to read the Research Proposal or the Literature Review Paper written by the student, judge its quality, provide feedback via the Chair (if necessary) and chair and evaluate the student’s subsequent presentation and oral examination. The composition of the student’s Reading Committee does not necessarily need to be determined prior to the submission of the written Research Proposal or Literature Review Paper. After passing both components of the Comprehensive, the student

will make her/his research proposal available to all Advisory Committee members via their OWL Advisory Committee website, so they can use it as a reference to gauge the student's progress over the years.

Content: The development of the research proposal will include three steps:

#### Written Research Proposal

This document, written by the student, needs to summarize the specific research directions that the candidate is planning to pursue during her/his Ph.D. research work. It should be a document of 10 pages maximum (double spacing, 12 point font) with no more than 1 additional page of references. Figures and tables can be inline or included at the end of the document. Figures and tables must be of adequate size that all text can be easily read. In addition, a title and abstract (200 words maximum) must be provided on a separate page and will be the same as that used for the oral presentation. The document should include the motivations for doing research in the relevant research field and the impact of the research on society, background research (including a review of the relevant literature), a presentation of theoretical and/or experimental techniques that will be used, a description of the methodology that will be utilized to obtain the data and analyze them, a detailed timeline with intermediate milestones, a list of potential outcomes and final objectives of the proposed research, with special emphasis on their significance and originality. If applicable, the proposal should also mention preliminary results that have already been obtained by the student or by others in her/his research group. The proposal should also refer to similar studies that have been conducted by other researchers, with a focus on synergy with other studies. The amount of research being proposed must be commensurate to the duration of the Ph.D. studies. The language must be accessible to a Physics faculty member working in a different research area.

#### Written Literature Review Paper

The subject of the Literature Review Paper will be material that is closely related to the field pertaining to the student's PhD research. It is acceptable (and even encouraged) that the student writes the Literature Review Paper in such a way that it eventually serves as the basis for the introduction of the student's PhD thesis. Although length is not the sole criterion for judging the adequacy of the paper, it is expected that it should contain a minimum of 25 pages of material, excluding references, singly-spaced with a 12 pt font. Typical reports are ~40 pages in length.

#### Oral Presentation

If the written Research Proposal or Literature Review Paper is judged acceptable by the Reading Committee (see below) the student will prepare an oral presentation based on the written material (30 to 40 minutes maximum) which is public. The oral presentation will summarize and expand on the material contained in the written Research Proposal or Literature Review Paper. In the case of the Research Proposal the focus should be on motivations, background, methodologies, milestones, results and objectives. The language and level used in the oral presentation must be accessible to a Physics Ph.D. student working in a different research area. The presentation will be open to all of the graduate students and faculty members within the Department.



## Oral Examination

The oral examination must immediately follow the oral presentation and will be divided in two parts: 1) a round of questions-and-answers (approximately 5 to 15 minutes in length) open to all of the audience of the oral presentation, except the Reading Committee and 2) a closed door examination, normally comprising two rounds of questions of 30 to 45 minutes in total, in which each member of the Reading Committee will question the student for 10 to 15 minutes. Questions from the Reading Committee may be specific, related to the written proposal and the oral presentation, and the generic scientific principles applicable to the research. Normally, the total exam length (including the oral presentation and oral examination) should not exceed 2 hours.

**Supervisor's Role:** It is expected that the supervisor will advise and assist the student in selecting the topic and scope of the Research Proposal or the Literature Review Paper. The student is required to submit their written presentation and their oral presentation to their supervisor at least two working days before submitting the paper or giving the talk, in part to determine if any confidentiality issues exist. If confidentiality issues exist, then appropriate steps will be taken to satisfy all parties (this could include, perhaps, a non-disclosure agreement among the Reading Committee). It is expected that the supervisor reviews preliminary drafts of the written Research Proposal or Literature Review Paper and/or the slides of the oral presentation in order to provide comments for the student to improve the documents. However, it is not the role of the supervisor to correct every mistake or misconception present in the Research Proposal or Literature Review Paper. It is the student's responsibility to ensure its overall completeness and accuracy. In addition, it is the student's responsibility to confirm the availability of necessary resources for the project with the supervisor.

**Timing:** The written Research Proposal or Literature Review Paper is due by 5 p.m. on a date approximately 75 days after passing component 1 of the Comprehensive (written examination). Late manuscripts will be treated as an unacceptable first submission (i.e. a failure) of the written Research Proposal or Literature Review Paper. The Research Proposal or Literature Review Paper is then reviewed in the standard way (see below).

The student's Reading Committee will review the written Research Proposal or Literature Review Paper within approximately 15 days and judge it (with a majority vote) to be either acceptable or unacceptable.

If the written Research Proposal or Literature Review Paper is judged unacceptable, it is marked as a failure and returned to the student for revisions. In this case, the Reading Committee will also provide written comments on how to improve the Research Proposal or the Literature Review Paper and then schedule a resubmission date for the revised Research Proposal or Literature

Review Paper, which must be no more than 30 days from the communication of the comments to the student. A resubmitted proposal automatically proceeds to the oral presentation.

The judgement on the Research Proposal or the Literature Review Paper is communicated by the Chair of the Reading Committee to the Graduate Chair who informs the student about the outcome in written form (via e-mail in case of acceptable, in official writing in case of unacceptable).

The oral presentation must be scheduled by the student for a date that is no more than 30 days after the communication of the results of the written Research Proposal or Literature Review Paper (or no more than 30 days after its resubmission, if the Research Proposal or the Literature Review Paper was originally marked as unacceptable). It is the student's responsibility to contact their Reading Committee for scheduling the presentation in due time at a mutually agreeable date and to make sure that the oral presentation will be properly advertised within the Department by sending the title and abstract to the Graduate Coordinator (or other designated person) at least 10 working days before the selected date.

The oral examination must immediately follow the oral presentation. At the end of the oral examination the student is asked to leave the room and, after a short discussion, the Reading Committee will assign a pass/fail grade (by majority vote) for the student's performance during the oral presentation and examination. Serious mistakes and misconceptions in fundamental physics concepts that emerge during the presentation and/or examination process will lead to a fail grade. Each student is allowed one failure during the entire Research Proposal or Literature Review Paper process (irrespective of a failure on Component 1 of the Comprehensive (the written examination)). This means that a student whose written Research Proposal or Literature Review Paper was initially accepted by the Reading Committee has two attempts to pass the oral examination. However, a student whose initial written Research Proposal or Literature Review Paper was rejected has only one attempt to pass the oral examination. The accumulation of two failures in this part of the comprehensive exam will result in the removal of the student from the Ph.D. Physics Program.

The judgement on the Oral Examination is communicated to the Graduate Chair.

#### Final Outcome for the Comprehensive Exam

The Graduate Chair will officially communicate, in writing, the final outcome of the Comprehensive process to the student. The result will be pass/fail on the Comprehensive as a whole.

## 10. ASTRONOMY 9001- COMPREHENSIVE ASTRONOMY

Astronomy 9001, the Astronomy Comprehensive Examination (in short: Comprehensive), is a requirement which must be fulfilled by all graduate students in the Astronomy Ph.D. program. Successful completion of this required Comprehensive appears on the transcript as a pass for the 9001 course.

**Purpose:** The Astronomy Comprehensive Examination allows PhD candidates in Astronomy at Western to demonstrate within the first year of study that they have mastered an adequate level of general knowledge in astronomy and physics and are prepared to pursue their PhD research work in their chosen sub-field. This mastery must be at a level to suggest that they will be able to successfully complete and defend their thesis in an acceptable period of time.

**Format:** The Comprehensive consists of two components: Component (1), the written tests and final exam of the graduate course Astronomy 9610 "Fundamentals of Astrophysics," to test background knowledge and adequate problem-solving ability, and Component (2), a review paper written by the student and focused on their PhD research topic. The material of the student's

review paper forms the basis of an oral exam.

Timing: Entering PhD students must enroll in Astronomy 9610 to take the tests and exams of the course at the first available fall offering. The written review paper is to be completed during the winter term immediately following the completion of Astronomy 9610. Deviations from these guidelines may be considered by the Ph.D. student's Advisory Committee in special cases.

### Astronomy Comprehensive Component 1: The Tests and Final Exam of Astronomy 9610

Format: The student must complete all tests and the final exam of the course Astronomy 9610 "Fundamentals of Astrophysics". This may be done within the context of taking the course for graduate credit; however, a sufficiently prepared student may simply choose to write the tests and final without enrolling in the course. For the purpose of the Comprehensive, there is no requirement to complete the course problem sets.

Content: The textbook for Astronomy 9610 is "An Introduction to Modern Astrophysics, 2nd Edition" by Carroll & Ostlie (2007). All course materials and content are drawn from this text, as set by the course instructor. Learning goals and objects will be provided as part of the course materials.

Marking and Outcome: To pass Component (1), the student must obtain a mark of 80% or higher on the weighted-average over all of the tests and final exam of Astronomy 9610. Missed tests must be made up and cannot be accommodated by re-weighting a partially completed set of tests and exam. Students who meet this standard are deemed to have passed Component (1) and can move on to Component (2), the written report, in their next term of study. Students who receive a grade of between 70 and 79% are deemed to have failed Component (1). Such students may be invited by their Advisory Committee to take a make-up exam during the April final examination period. The reference material for this make-up exam will be identical to the course offering. Such students will also proceed to Component (2) in the term immediately after their unsuccessful attempt of Component (1). A student who is not invited by their Advisory Committee to take the April make-up is deemed to have failed the Astronomy Comprehensive Examination and must leave the program. Finally, students who receive 69% or less will not be offered a make-up exam and are deemed have failed the Astronomy Comprehensive Examination and must leave the program.

Pre-Qualification by MSc Students: MSc students who complete Astronomy 9610 with a grade of 80% or higher on the weighted-average over all of the tests and final exam are deemed "pre-qualified" for Component (1) of the Astronomy Comprehensive Exam. If they move on to PhD studies, they receive an automatic pass on Component (1) and can move straight to Component (2).

### Astronomy Comprehensive Component 2: The Review Paper and Oral Exam

A student who passes Component 1 of the Comprehensive must then submit a written Review Paper, which will be defended orally.

Committee: Each student will be assigned a Reading Committee who will oversee the student's review paper and oral exam. The Reading Committee will consist of the student's supervisor and two additional Astronomy faculty members. It is the responsibility of the Reading Committee to read the review paper, judge its quality, provide feedback (if necessary), and conduct the oral examination. The composition of the student's Reading Committee does not need to be determined prior to the submission of the review paper.

Content: The subject of the review paper will be material that is closely related to the sub-field pertaining to the student's PhD research. The paper should include a detailed literature review. It is acceptable (and even encouraged) that the student writes the review paper in such a way that it eventually serves as the basis for the introduction of the student's PhD thesis. Although length is not the sole criterion for judging the adequacy of the paper, it is expected that it should contain a minimum of 25 pages of material, excluding references, singly-spaced with a 12 pt font. Typical reports are ~40 pages in length.

Supervisor's Role: It is expected that the supervisor will aid the student in selecting the topic and scope of the review paper, and the supervisor may also approve an outline of the paper. The supervisor may review drafts of the review paper in order to provide comments for the student to improve the document. However, it is not the role of the supervisor to correct every mistake or misconception present in the paper. It is the student's responsibility to ensure overall completeness and accuracy.

Timing: For students on the normal timeline (Astronomy 9610 in the fall term and the review paper in the winter term), the review paper is due by 5:00 pm on the first Friday in April, unless an alternate deadline has been arranged by the student's Reading Committee. Late papers will be marked as failures and then reviewed in the standard way (see below). For other students, the timeline for the completion and evaluation of the written report will be set by the student's Advisory Committee.

Evaluation: The student's Reading Committee will review the report within two weeks and judge it to be either acceptable or not acceptable. If the paper is judged acceptable, the oral presentation and exam will be scheduled for some time before the last business day in April (if possible). If the report is judged unacceptable, the paper is marked as a failure and returned to the student for revision. The Reading Committee will provide written comments on how to improve the paper and then schedule a resubmission date for the revised paper, which must be before the last business day in June.

The Oral Presentation and Exam: The student will give a seminar for the Reading Committee of no more than 30 minutes in length, and the subject matter **MUST** be the material contained in the review paper. The Reading Committee will then proceed with two rounds of questions. The rounds will be of a duration decided by the committee beforehand, but the total exam length (including the seminar) should not exceed two hours. Committee members may ask questions only during their turn. At the end of the question period, the student will be asked to leave the room and the committee will confer and agree on a decision. The result will be a pass or fail decided by majority vote of the committee members. The student is then asked back into the examination room, and the committee will inform him/her of the outcome of the exam. Each

student is allowed one failure during the oral presentation and exam process (independent of any failure in Component 1). This means that a student whose review paper was initially accepted by the Reading Committee can have two attempts to pass the oral defense. However, a student whose initial review paper was rejected has only one attempt to pass the oral defense. The accumulation of two failures in this part of the comprehensive exam will result in the removal of the student from the PhD Astronomy Program.

### Final Outcome for the Comprehensive Exam

The Department's Associate Chair for Graduate Studies will officially communicate in writing the final outcome of the comprehensive exam process to the student. The result will be pass/fail on the exam as a whole. The decision is final.

## 11. COLLABORATIVE PROGRAMS

Students based in the Department of Physics and Astronomy can combine their degree with one of the following collaborative programs:

- Environment & Sustainability  
[http://www.uwo.ca/enviro/graduate/collaborative\\_program/index.html](http://www.uwo.ca/enviro/graduate/collaborative_program/index.html)
- Planetary  
Science  
<http://cpsx.uwo.ca/>
- Scientific Computing  
<http://www.apmaths.uwo.ca/gpsc/>

Collaborative programs usually require additional coursework and regular attendance at the program's seminar series.

Students enrolled in Collaborative Programs still must take the seminar course of their home program.

When a student is enrolled in a collaborative program the student must fulfill all requirements of the physics or astronomy “home” program, respectively for successfully finishing the degree.

## 12. PHYSICS M.SC. RESEARCH

# REPORT Physics MSc Research Report

## Guidelines

The procedure for completing the project M.Sc. in Astronomy is as follows. Note that at least 5 working days are required for the Project Paper to be evaluated.

Students considering submitting their Project Paper to their Advisory Committee less than 5 working days before a term deadline do so knowing they may have to register for an additional term. Hence, we suggest students submit their Project Paper at least 10 working days before the end of a term to ensure they will not have to register for an additional term.

1. The student submits their Project Paper to their Advisory Committee and to their Supervisor(s). The student should send the Project Paper electronically as a PDF file, and should consult their AC to determine if anyone would also require a paper copy, in which case the student should provide that to them.
2. The student notifies the Graduate Chair of the submission.
3. The Supervisor should, shortly thereafter, email the AC members a suggested grade, along with general comments and a justification of the grade.
4. The Advisory Committee will typically have 5 business days to read the paper. The AC members should notify the Supervisor(s) when they have finished reading the paper and give a grade to the Supervisor.
5. When the Supervisor(s) has/have received grades from the AC a final mark acceptable to all parties should be decided.
6. The Supervisor will inform the student and the Academic Program Coordinator of the mark, and whether all requirements for the M.Sc. have been completed. The Academic Program Coordinator will then submit this information to the Registrar.

In the event members of the AC are not available, a minimum of the Supervisor(s) plus at least one other AC member is required to evaluate a Project Paper. If this requirement is not met the Graduate Chair should be informed and an examiner will be provided.

Guidelines for project marks are as follows. To consider the Project Paper a pass a student

is expected to receive a grade of 70% or higher. To be considered for admission to the Ph.D. program a mark of 85% or higher is expected.

7. Astronomy MSc projects and theses alike should be submitted through Turnitin (<http://turnitin.uwo.ca/>).

## 13. ASTRONOMY M.Sc. RESEARCH PROJECT

### A. Astronomy MSc Research Project Guidelines

The Astronomy MSc research project requirements can be met by either submitting a monograph describing the project, or by a set of one or more refereed articles led or co-authored by the student. Monograph-style MSc project reports are expected to be approximately 50 pages in length: double-spaced, with lines numbered, and including figures, tables, and references. Refereed article-style MSc project reports should include the relevant articles authored or co-authored by the student, along with the following additional sections written by the student: an Introduction to the topic of the research project (4-6 pages double-spaced) with appropriate references, a Research Methods section that describes the many details missing from the refereed articles, including additional figures and tables as necessary, and a Co-authorship Statement. The Co-authorship Statement needs to explicitly describe the student's role and contribution to the monograph or to the set of articles included in the MSc project report. All co-authors on any included articles need to either sign the Co-authorship Statement, or to indicate their agreement to it by email.

Astronomy MSc projects and theses alike should be submitted through Turnitin (<http://turnitin.uwo.ca/>).

### B. Completing the MSc Astronomy Project

The procedure for completing the project M.Sc. in Astronomy is as follows. Note that at least 5 working days are required for the Project Paper to be evaluated.

Students considering submitting their Project Paper to their Advisory Committee less than 5 working days before a term deadline do so knowing they may have to register for an additional term. Hence, we suggest students submit their Project Paper at least 10 working days before the end of a term to ensure they will not have to register for an additional term.

7. The student submits their Project Paper to their Advisory Committee and to their Supervisors(s). The student should send the Project Paper electronically as a PDF file, and should consult their AC to determine if anyone would also require a paper copy, in which case the student should provide that to them.
8. The student notifies the Graduate Chair of the submission.
9. The Supervisor should, shortly thereafter, email the AC members a suggested grade,

along with general comments and a justification of the grade.

10. The Advisory Committee will typically have 5 business days to read the paper. The AC members should notify the Supervisor(s) when they have finished reading the paper and give a grade to the Supervisor.
11. When the Supervisor(s) has/have received grades from the AC a final mark acceptable to all parties should be decided.
12. The Supervisor will inform the student and the Academic Program Coordinator of the mark, and whether all requirements for the M.Sc. have been completed. The Academic Program Coordinator will then submit this information to the Registrar.

In the event members of the AC are not available, a minimum of the Supervisors(s) plus at least one other AC member is required to evaluate a Project Paper. If this requirement is not met the Graduate Chair should be informed and an examiner will be provided.

Guidelines for project marks are as follows. To consider the Project Paper a pass a student is expected to receive a grade of 70% or higher. To be considered for admission to the Ph.D. program a mark of 85% or higher is expected.

## 14. THESIS

**Before submitting a thesis to the university, the supervisors have to ensure that the thesis was checked for copy right issues by turnitin.com (available from the university: <http://turnitin.uwo.ca>).**

Requirements for the preparation and defense of M.Sc. and Ph.D. theses, including information on the electronic submission process and formatting, as well as the timelines required by the School of Graduate and Postdoctoral Studies (SGPS), are outlined on the SGPS website at: [https://grad.uwo.ca/current\\_students/thesis/index.html](https://grad.uwo.ca/current_students/thesis/index.html).

SGPS thesis regulations are outlined on the following website:  
[http://grad.uwo.ca/current\\_students/regulations/8.html](http://grad.uwo.ca/current_students/regulations/8.html)

Theses must be free of typographical, grammatical and spelling errors prior to submission for examination. In addition, all required sections of the thesis (including dedications, acknowledgments, approvals for animal use, ethics form, copyright waivers and curriculum vitae) must be included in the submitted copy. Incomplete theses and/or theses that are difficult to read because of poor writing are unacceptable and may be rejected and returned to the student for correction and resubmission. Students should consult SGPS guidelines prior to preparation of the thesis.

In time before each term's deadline for thesis submission the Academic Coordinator (in the



moment: Assistant to the Chair further on named Academic Coordinator) sends a reminder e-mail to all faculty and graduate students with the deadlines. Either the supervisor or the graduating student delivers the necessary information to the Academic Coordinator to complete:

a) for M.Sc. a Master's Thesis Supervisor Approval Form  
[http://www.grad.uwo.ca/doc/academic\\_services/thesis/masters\\_supervisor\\_approval\\_form.pdf](http://www.grad.uwo.ca/doc/academic_services/thesis/masters_supervisor_approval_form.pdf)  
and for

b) Ph.D. theses, a Doctoral Thesis Supervisor Approval Form  
[http://www.grad.uwo.ca/doc/academic\\_services/thesis/doctoral\\_supervisor\\_approval\\_form.pdf](http://www.grad.uwo.ca/doc/academic_services/thesis/doctoral_supervisor_approval_form.pdf)  
indicating the thesis is ready for examination.

The Academic Coordinator collects the necessary signatures from faculty and student. For students with two supervisors (either two joint or a primary supervisor plus co-supervisor), both supervisors must sign the form. The Academic Coordinator sends this form electronically to SGPS.

Importantly, the thesis examiners are not copy editors, and the supervisor(s) should not sign the Master's or Doctoral Thesis Supervisors Approval Form unless the thesis is acceptable in both form and content. In rare cases where the thesis is submitted without the approval of the supervisor(s), this must be indicated on the Master's or Doctoral Thesis Supervisors Approval Form and reasons for withholding approval provided, in writing, to the Graduate Chair.

Students should allow the supervisor at least two weeks for review of a M.Sc. thesis or at least three weeks for review of a Ph.D. thesis (depending on the time schedule, more time may be required). The supervisor are expected to review a thesis draft only once or twice before submission. At that point he/she should identify any necessary revisions and the approximate time frame required to make the changes, and convey this feedback to both the student. It is the responsibility of the student to ensure that the recommended changes are made.

#### A. M.Sc. Thesis in Physics or Astronomy

1) A Proposed Master Thesis Examination Board form:  
[http://www.grad.uwo.ca/doc/academic\\_services/thesis/masters\\_thesis\\_examination\\_board.pdf](http://www.grad.uwo.ca/doc/academic_services/thesis/masters_thesis_examination_board.pdf)  
needs to be completed by the Academic Coordinator. Therefore the supervisor should contact examiners at least 8 weeks in advance of the exam.

##### Composition of Master's Thesis Examination Board:

1. Program Examiner 1: One faculty member from within Physics or Astronomy program (may be Advisor)
2. Program Examiner 2: A second faculty member from within Physics or Astronomy program (not an Advisor) – may be cross-appointed member from another department
3. University Examiner: One faculty member within Western (not P&A)

After the examiners' agreement to serve and availability statement the supervisor informs the Academic Coordinator and signs the Proposed Master Thesis Examination Board form to be

submitted to the Graduate Chair at least four weeks before the thesis defense.

For approving the members of the student's examination board the Graduate Chair needs the title of the thesis as well as a short abstract. The Graduate Chair and the Academic Coordinator ensure the appropriateness of the examination board.

Appropriateness: Examiners must be seen to be able to examine the student and the thesis at arm's-length, free of substantial conflict of interest from any source. The test of whether or not a conflict of interest might exist is whether a reasonable outside person could consider a situation to exist that could give rise to an apprehension of bias. Co-authors or collaborators of any component of the thesis may not serve as Examiners.

Once the two forms are received by the Graduate Chair and signed, the Academic Coordinator mails the Proposed Master Thesis Examination Board form electronically (via e-mail) to SGPS. Then authorization can be given to submit the electronic thesis via the [Scholarship@Western](mailto:Scholarship@Western) site. The School of Graduate and Postdoctoral Studies encourages students to follow the electronic submission option versus printing off unbound paper copies of the thesis for examination. The defense normally will not take place in fewer than three weeks after the thesis has been submitted.

All examiners must have membership through the School of Graduate and Postdoctoral Studies.

2) The student creates a Certificate of Examination according to his/her situation downloaded from [http://grad.uwo.ca/current\\_students/regulations/8.html](http://grad.uwo.ca/current_students/regulations/8.html) under 8.3.1.6.

This must be brought to the examination by the student or the supervisor.

3) The M.Sc. thesis form and content must be judged acceptable by a majority of the examiners before the defense may proceed. An electronic evaluation form shall be submitted by each examiner to the School of Graduate and Postdoctoral Studies at least three days before the defense for electronic thesis submissions or paper evaluations for the hardcopy thesis submission. If the thesis is judged unacceptable for defense, then the time period allotted for the defense will be used by the examining board, the candidate's supervisor and the Graduate Chair to recommend a course of action, which they will then discuss with the candidate. Please see the [Graduate Thesis Regulations](#) Section 8.5 for the appropriate timelines for resubmission. A new defense, normally with the same examining board, will be scheduled when the resubmitted thesis is in hand. The candidate will be given the opportunity to defend the resubmitted thesis at an oral examination. The decision, by majority vote of the examiners, on the acceptability of the thesis content and the decision on the oral defense are then final. A resubmitted thesis found to be unacceptable cannot be revised and submitted a third time.

4) The oral examination shall consist of:

a) An overview of the candidate's Master work. This involves a 30 to 35 minute oral presentation by the student. The student is responsible for ensuring that all necessary equipment is booked and functional for their presentation.

b) Questioning on the subject of the thesis, and/or pertinent topics arising from the thesis by the board of examiners.

5) The acceptability of the oral defense of the thesis shall be determined by a majority vote of the examiners present at the examination. If the thesis is acceptable, but the oral examination is unsatisfactory, a second oral examination (preferably with the same examining board) shall be scheduled no earlier than 30 days from the original defense.

6) The acceptability of the form of the thesis shall be determined by a majority vote of the examiners. If the content is acceptable, but the form is unacceptable, the candidate shall be advised in what respects the thesis is deficient. The examiners must be satisfied with any amendments or changes being recommended. Normally the supervisor withholds his/her signature from the Certificate of Examination Form until all recommended changes have been completed.

7) The candidate's Supervisor(s) must attend the examination but may not answer questions during the rounds of questioning, except under rare circumstances and at the invitation of the chair of the board of examiners. Visitors may attend at the discretion of the chair.

8) The decision to recommend the awarding or withholding of the degree shall be rendered at the conclusion of the examination, by the board of examiners, following discussion by the board and the candidate's supervisor, but in the absence of the candidate.

<b>MASTER'S THESIS DEFENSE TIMELINE</b>	
About 8 weeks prior to examination date	Supervisor contacts potential examiners
Six weeks prior to examination date	Supervisor provides Graduate Coordinator (delegated to Jodi Guthrie) with suggested examiners (after verifying their availability), title and abstract for the Graduate Chair approval. The Graduate Chair provides the student with either the approval of initial suggested committee or a revised approved committee.
Five weeks prior to examination date	The student/Supervisor finalizes the exam date with the entire examination board and provides the Graduate Coordinator with the date, time and location of the examination, as well as the format and whether it is an open or closed exam. The Graduate Coordinator will secure the Chair of the Examination Board.
Four weeks prior to examination date	Graduate Coordinator (delegated to Jodi Guthrie) prepares the Proposed Master Thesis Examination Board form for submission to SGPS by the four week deadline.
Three weeks prior to examination date	Master's Thesis Supervisor Approval Form is completed by the Graduate Coordinator (delegated to Jodi Guthrie), signed by the student and all supervisors and sent to SGPS. The student is then authorized by the Graduate Chair to electronically submit the thesis via the Scholarship@Western site or provide sufficient paper copies.
Three days prior to examination date	The examiners report back, to SGPS for electronic copies or the Graduate Coordinator for paper copies, on whether the thesis is approved to go forward to examination. The Graduate Coordinator/Assistant to the Chair posts the announcement for open defenses only.

For SGPS term deadlines for submission of a Master's thesis, please see the following link:

[https://grad.uwo.ca/current\\_students/thesis/timelines.html](https://grad.uwo.ca/current_students/thesis/timelines.html)

Please review the SGPS website below for details on the electronic thesis preparation process, formatting, etc.

[https://grad.uwo.ca/current\\_students/thesis/index.html](https://grad.uwo.ca/current_students/thesis/index.html)

For information on the thesis regulations, please see the following:

[https://grad.uwo.ca/current\\_students/regulations/8.html](https://grad.uwo.ca/current_students/regulations/8.html)

Revisions are due to be completed generally within two weeks, however, SGPS will allow up to six weeks to complete the revisions and submit the final thesis. You are only considered to have completed your degree after you have uploaded your final approved thesis to Scholarship@Western and submitted your signed Certificate of Examination form to SGPS.

### A.1 Astronomy M.Sc. thesis guidelines

The Astronomy MSc research project requirements can be met by either submitting a monograph describing the project, or by a set of one or more refereed articles led or co-authored by the student. Monograph-style MSc project reports are expected to be approximately 50 pages in length: double-spaced, with lines numbered, and including figures, tables, and references. Refereed article-style MSc project reports should include the relevant articles authored or co-authored by the student, along with the following additional sections written by the student: an Introduction to the topic of the research project (4-6 pages double-spaced) with appropriate references, a Research Methods section that describes the many details missing from the refereed articles, including additional figures and tables as necessary, and a Co-authorship Statement. The Co-authorship Statement needs to explicitly describe the student's role and contribution to the monograph or to the set of articles included in the MSc project report. All co-authors on any included articles need to either sign the Co-authorship Statement, or to indicate their agreement to it by email.

An Astronomy MSc research thesis option is also available. The written requirements for the MSc thesis are similar to those for the research project. However, the MSc thesis requires an oral defense and formatting according to the School of Graduate and Postdoctoral Studies (SGPS) thesis format requirements ([http://grad.uwo.ca/current\\_students/thesis/formatting.html](http://grad.uwo.ca/current_students/thesis/formatting.html)). The MSc thesis needs to be submitted to SGPS at least three weeks prior to the anticipated defense, as outlined in [http://grad.uwo.ca/current\\_students/thesis/timelines.html](http://grad.uwo.ca/current_students/thesis/timelines.html).

Astronomy MSc projects and theses alike should be submitted through Turnitin:

(<http://turnitin.uwo.ca/>).”

### B. Ph.D. Thesis in Physics or Astronomy

1) A Proposed Doctoral Thesis Examination Board form

[http://www.grad.uwo.ca/doc/academic\\_services/thesis/doctoral\\_thesis\\_examination\\_board.pdf](http://www.grad.uwo.ca/doc/academic_services/thesis/doctoral_thesis_examination_board.pdf)  
needs to be completed by the Academic Coordinator. Therefore, the supervisor should contact examiners at least 8 weeks in advance of the exam.

Composition of Ph.D.'s Thesis Examination Board:

1. Program Examiner 1: One faculty member from within Physics or Astronomy program (may be Advisor)
2. Program Examiner 2: A second faculty member from within Physics or Astronomy program (not an Advisor) – may be a cross-appointed member from another department
3. University Examiner: One faculty member from within Western (not P&A)
4. External examiner

After the examiners' agreement to serve and availability statement the supervisor informs the Academic Coordinator and signs the Proposed Doctoral Thesis Examination Board form to be submitted to the Graduate Chair at least four weeks before the thesis defense.

For approving the members of the student's examination board the Graduate Chair needs the title of the thesis as well as a short abstract. The Graduate Chair and the Academic Coordinator ensure the appropriateness of the examination board.

Appropriateness: Examiners must be seen to be able to examine the student and the thesis at arm's-length, free of substantial conflict of interest from any source. The test of whether or not a conflict of interest might exist is whether a reasonable outside person could consider a situation to exist that could give rise to an apprehension of bias. Co-authors or collaborators of any component of the thesis may not serve as Examiners.

Once these forms are received by the Graduate Chair and signed, the Academic Coordinator mails the Proposed Doctoral Thesis Examination Board form electronically (via e-mail) to SGPS. Then authorization can be given to submit the electronic thesis via the [Scholarship@Western](mailto:Scholarship@Western) site. The School of Graduate and Postdoctoral Studies encourages students to follow the electronic submission option versus printing off unbound paper copies of the thesis for examination. The defense normally will not take place in fewer than five weeks after the thesis has been submitted.

2) SGPS's Thesis Coordinator creates a Certificate of Examination according to the student's situation (can be downloaded from [http://grad.uwo.ca/current\\_students/regulations/8.html](http://grad.uwo.ca/current_students/regulations/8.html) under 8.3.1.6.) and provides it to the Chair of the examination to bring to the examination.

3) The Ph.D. thesis form and content must be judged acceptable by a majority of the examiners before the defense may proceed. An electronic evaluation form shall be submitted by each examiner to the School of Graduate and Postdoctoral Studies at least three days before the

defense for electronic thesis submissions or paper evaluations for the hardcopy thesis submission. If the thesis is judged unacceptable for defense, then the time period allotted for the defense will be used by the examining board, the candidate's supervisor and the Graduate Chair to recommend a course of action, which they will then discuss with the candidate. Please see the [Graduate Thesis Regulations](#) Section 8.4 for the appropriate timelines for resubmission. A new defense, normally with the same examining board, will be scheduled when the resubmitted thesis is in hand. The candidate will be given the opportunity to defend the resubmitted thesis at an oral examination. The decision, by majority vote of the examiners, on the acceptability of the thesis content and the decision on the oral defense are then final. A resubmitted thesis found to be unacceptable cannot be revised and submitted a third time.

4) The oral examination shall consist of:

a) An overview of the candidate's Ph.D. work. This involves a 45 to 50 minute oral presentation by the student. The student is responsible for ensuring that all necessary equipment is booked and functional for their presentation.

b) Questioning on the subject of the thesis, and/or pertinent topics arising from the thesis by the board of examiners.

5) The acceptability of the oral defense of the thesis shall be determined by a majority vote of the examiners present at the examination. If the thesis is acceptable, but the oral examination is unsatisfactory, a second oral examination (preferably with the same examining board) shall be scheduled no earlier than 30 days from the original defense.

6) The acceptability of the form of the thesis shall be determined by a majority vote of the examiners. If the content is acceptable, but the form is unacceptable, the candidate shall be advised in what respects the thesis is deficient. The examiners must be satisfied with any amendments or changes being recommended. Normally the supervisor withholds his/her signature from the Certificate of Examination Form until all recommended changes have been completed.

7) The candidate's Supervisor(s) must attend the examination but may not answer questions during the rounds of questioning, except under rare circumstances and at the invitation of the chair of the board of examiners. Visitors may attend at the discretion of the chair.

8) The decision to recommend the awarding or withholding of the degree shall be rendered at the conclusion of the examination, by the board of examiners, following discussion by the board and the candidate's supervisor, but in the absence of the candidate.

Program and University examiners must have membership through the School of Graduate and Postdoctoral Studies.

DOCTORAL THESIS DEFENSE TIMELINE
----------------------------------

Eight weeks prior to examination date	Supervisor provides the Graduate Coordinator (delegated to Jodi Guthrie) with suggested examiners (after verifying their availability), title and short abstract for the approval by the Graduate Chair. SGPS discourages students from communicating directly with the examiners, in particular the external examiner. The Graduate Coordinator provides the student and Supervisor with either the approval of the initial suggested committee or a revised approved board.
Seven weeks prior to examination date	Supervisor finalizes the exam date with the entire board and the student/supervisor provide the Graduate Coordinator (delegated to Jodi Guthrie) with the date, and time of the exam and lecture, as well as the format and whether it will be a closed or open exam. The Graduate Coordinator will secure the reservation of the room for the public lecture.
Six weeks prior to examination date	Graduate Coordinator (delegated to Jodi Guthrie) prepares the Proposed Doctoral Thesis Examination Board form for electronic submission to SGPS by the six-week deadline and provides the student with the Doctoral Thesis Supervisor Approval Form.
Five weeks prior to examination date	The completed Doctoral Thesis Supervisor Approval Form is completed by the Graduate Coordinator (delegated to Jodi Guthrie), signed by the student and all supervisors and send to SGPS. Once the Graduate Coordinator/Graduate Chair approves the doctoral thesis for distribution, the student uploads the thesis via the Scholarship@Western site or provides the Graduate Coordinator with sufficient paper copies for distribution.
One week prior to examination date	The examiners report back to SGPS on whether the thesis is approved to go forward to examination. The Graduate Coordinator/Assistant (delegated to Jodi Guthrie) to the Chair posts the examination announcement on the web, paper copy in the buildings and emails the department.
<p>For SGPS term deadlines for submission of a Doctoral thesis, please see the following link: <a href="http://grad.uwo.ca/current_students/doctoral_thesis_timeline.htm">http://grad.uwo.ca/current_students/doctoral_thesis_timeline.htm</a></p> <p>Please review the SGPS website below for details on the thesis preparation guidelines. <a href="http://grad.uwo.ca/current_students/thesis_regulation_guide.htm">http://grad.uwo.ca/current_students/thesis_regulation_guide.htm</a></p> <p>Revisions are due to be completed generally within two weeks, however, SGPS will allow up to six weeks to complete the revisions and submit the final thesis. You are only considered to have completed your degree after you have uploaded your final approved thesis to Scholarship@Western and submitted your signed Certificate of Examination, as well as the Library and Archives form as well as the ProQuest Subject Code forms to SGPS.</p>	

## 15. CAREER PREPARATION

In order to prepare for a career after the degree it is important to address not only the subject specific qualifications but also a set of soft skills.

### a) My Grad Skills

Therefore the students are encouraged to take the short courses offered on-line.

<https://www.mygradskills.ca/>

You should be able to log-in with your Western-ID.

There are courses about:

- Career development
- Communication
- Entrepreneurship
- Research
- Teaching

#### b) Non-academic Career websites

- <http://versatilephd.com>
- [http://prospects.ac.uk/your\\_phd\\_what\\_next\\_non\\_academic\\_jobs.html](http://prospects.ac.uk/your_phd_what_next_non_academic_jobs.html)
- <http://www.careereducation.columbia.edu/resources/tipsheet/non-academic-career-options-phds-and-mas>
- <http://sciencecareers.sciencemag.org>
- [http://www.columbia.edu/cu/tat/pdfs/academic\\_administration.pdf](http://www.columbia.edu/cu/tat/pdfs/academic_administration.pdf)

#### c) Academic Career websites

- <http://www.eui.eu/ProgrammesAndFellowships/AcademicCareersObservatory/Index.aspx>

## 16. TRAVEL

Western has adopted a new Safety Abroad policy designed to help ensure safe experiences for Western undergraduate and graduate students who travel internationally as part of a university activity. Western International requests that you share this important information with you decanal team, department chairs, faculty and staff members.

The policy and its accompanying procedures are meant to offer assistance in managing the risks associated with University-sanctioned international programs and activities and to provide processes to undertake the following:

- a) Approval of student international travel for University-sanctioned activities and programs
- b) Risk assessment of travel locations, regions and/or countries
- c) Centralized and accessible risk management resources to enable University travellers to be informed of, and manage the risks associated with, travelling abroad

The policy and procedures are effective immediately and should be consulted prior to authorizing any student travel abroad. The full policy is available on the University Secretariat



website at: [http://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp153.pdf](http://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp153.pdf)

Additional information and resources for members of the Western community planning international travel are available at <http://www.international.uwo.ca/staff/travel.html>

Questions about the policy and procedures can be directed to Lise Laporte, Director, International Learning at [lise.laporte@uwo.ca](mailto:lise.laporte@uwo.ca) ext.85489.

In addition, Western is a member of International SOS, the world's leading medical & travel security assistance company: <https://www.internationalsos.com/>

To get more information, a membership card, Western's membership number and due the required pre-departure training sessions, please visit:  
[http://www.uwo.ca/international/learning/safety\\_abroad/index.html](http://www.uwo.ca/international/learning/safety_abroad/index.html)

## APPENDIX

### Appendix I: Manual for Physics & Astronomy Advisory Committee Meetings (ACMs)

Twice yearly (or more often if needed), graduate students in Physics & Astronomy are required to meet with their Advisory Committees (ACs) to check that they are making satisfactory progress in the program. Each Advisory Committee is composed of three faculty members including the student's supervisor. Prior to the meeting, the students submit a short report updating their progress since the previous meeting and laying out a plan for the next 6 months or so. The ACs evaluate progress in class work and research, and are available to discuss near- and long-term plans.

Currently, there are approximately 80 P&A graduate students and 30 faculty serving on ACs. Each faculty member is serving on approximately 10 ACs. To administer these meetings, we will be using Project sites within OWL. Below is a description of how these will be used, and the responsibilities of the various parties.

#### 1. The Common Project Site: PhysAstro Advisory Committee Meetings

The role of the common project site is for the department to keep track of student progress reports and advisory committee reports to monitor the ACM process.

- Student progress reports will be submitted at least 48 hours prior to each semi-annual ACM as a pdf file to "Assignments".
- AC reports will be submitted by the supervisor within 48 hours of the ACM as pdf files to the "Dropbox".

These documents are time-stamped and available to the Grad Chair and ACM support staff to

review.

The AC reports will all have a common naming convention:  
studentsurname\_supervisorsurname\_yearX.pdf

e.g., Smith\_Jackson\_2013A.pdf for the first ACM of the year.

The latter is incremented with each subsequent ACM in a given year. For a student with co-supervisors, the name of the one who submits the report will be included in the filename. Other AC members can submit additional reports as desired, replacing the supervisor's surname with their own. When the ACM deadline has passed, the Grad Chair and ACM support staff can quickly see which students have not submitted progress reports by viewing the assignment report, and determine which AC reports are missing by looking within the common Dropbox. Missing reports will be grounds for an unsatisfactory evaluation unless the student has an exemption from the Grad Chair.

All faculty members, all graduate students, Clara Buma (Brian Davis), and Henry Leparkas will be enrolled in the common project site. Most faculty members (with the exception of the Graduate Chair and other maintainers) and all students will have "access" privileges. This means that they are only able to see material that they themselves upload to either the Dropbox or the Assignments. This is the standard protocol to maintain student and faculty privacy.

## 2. Individual Project Sites: ACM - Student's Firstname Surname

The purpose of the individual student project site is for communication between the graduate student and the AC members.

- Each student is responsible for setting up their individual project site, which will follow the naming convention of "ACM - Firstname Surname", e.g., ACM - Jane Smith.
- The OWL tools to be included in this project are "Resources" and "Dropbox".
- Students will post their progress report to the Resources section, and the supervisor will post the consensus ACM report to the Dropbox.
- After receiving the AC report in her/his DropBox (uploaded by the supervisor) the student will immediately post it to the Resources on her/his individual OWL project site (for her/his AC members) (If this is not posted immediately, the Graduate Chair will be required to send an email to the supervisor stating a report is missing and another meeting is required.)

If you don't remember how to post to Resources from a Drop Box here are the

instructions: In the menu bar of the relevant site, click Drop Box.

Click the black triangles to the left of "Title" to expand all the folders in the Drop Box, or click the folder icon to the left of the name of the folder you wish to expand. (If a folder contains items not currently displayed, a plus sign will appear on the folder icon.)

Click on the name of the file you want, and download it onto your computer. Click on the Resources menu item to the left.

Click on the the Add pull-down menu, and choose Upload. Follow the instructions to upload it from your computer

Both progress and ACM reports should be archived in the Resources so that they are available throughout the student's tenure in Physics & Astronomy.

Students will also keep an updated CV and/or resumé in their Resources.

All reports should be pdf files and include "year" (e.g., 2013A, 2013B, etc.) in the filename to indicate the appropriate ACM.

The people to be enrolled in the project and their status assignments are as follows:

1. Student - maintain
2. Clara Buma (Brian Davis) - maintain - cbuma (Do NOT use cbuma@uwo.ca)
3. Grad Chair - access - physastroacm@gmail.com
4. AC faculty members - access

Details on how to set up the individual student sites are available at the end of this Appendix I.

### 3. Student's Progress Report

The progress report is intended to be a record of the student's progress to date in the program, focussing on updates since the previous ACM, plans until the next one, and responses to issues raised in the previous ACM report (if any) as detailed below. The information can be presented as bullet points; the report should take only an hour or so to update once the first one is created.

Here are specific items to be included in the report:

1. Photo (for the Grad Chair).
2. Brief (~ 1 paragraph) description of the student's research area and the motivation for the research project. This can be updated as the project evolves. The purpose of this is to remind the committee of the context for the research project.
3. History of progress reports, separated by ACM dates. This text should not be edited after the relevant ACM, unless requested by the AC. (The reports for April 2013 do not need to include information from all previous ACMS.)
4. Progress since last ACM (include such things as conferences attended, courses completed (including marks), status of papers/thesis, etc.)
5. Responses to issues arising from the previous ACM report, if there are any.
6. Issues the student would like to discuss (e.g., course selection, career plans,

roadblocks, etc.).

Students will (1) post their progress report to the Resources in their individual project site for the AC to read, and (2) submit it to the common site as an Assignment for ACM record-keeping in the department.

The student progress report must be a pdf file.

#### 4. ACM Report

The report template for the ACM will be a common fillable pdf.

Once the report is finalized, the supervisor will deposit it

1. in the Dropbox of both the student's individual project site so that the student has a record of it and it is accessible to AC members for future meetings, and
2. the Dropbox of the common website so that the Grad Chair has a record of it. If other members of the committee do not agree with the report, then they have the option of submitting their own comments to the Dropbox of the common project site.

The Grad Chair should be notified by the AC of any issues (e.g., requiring an off-cycle ACM) arising from the ACM by email within OWL to the "course instructor".

After receiving the AC report in their Dropbox (deposited by the supervisor), the student will post it to the Resources on their individual ACM project site so the members of the AC can view it.

The ACM report must be a pdf.

#### 5. Scheduling and Meeting Procedures

During the fixed time period of the ACMs (the three weeks of final exam period in April, and the three weeks preceding Thanksgiving in September /October), the group meeting rooms PAB 101, 103, and 105 will be reserved exclusively for ACMs. Appropriate furniture (office-height tables and chairs) will be moved in as necessary, and a monitor will be placed in each room. A laptop can be hooked up to the monitor as needed for more comfortable viewing of documents or slides; alternatively, hard copy handouts can be provided to AC members. Projectors are not needed and will not be provided for ACMs.

Students are responsible for scheduling ACMs. Once a time has been chosen by mutual agreement of the AC members and the student, please contact Jodi to reserve a room for your ACM.

The (year)A ACM period is approximately the first two weeks of April

The (year)B ACM period is approximately the first two weeks of October

#### 6. Instructions for creating an individual ACM project site

1. Login to the owl portal: <https://owl.uwo.ca/portal>
2. On the left menu, choose Worksite Setup
3. From the top menu, choose New
4. Choose project site, click Continue
5. Input required (\*) information: title (ACM - Student's Surname, Firstname) and Site Contact Email, click Continue
6. From the pulldown menu, choose Home, Dropbox, Resources, click Continue
7. Choose Publish site, Private, Limited to whom I add manually and click Continue
8. Click Create Site
9. Choose your site from the list, and then choose Site Info
10. From the top menu, choose Add Participants
11. Follow the instructions to add your ACM members to the top box. Use their UWO emails), and also add physastroacm@gmail.com, and cbuma (bdavis66) (Do NOT use cbuma@uwo.ca - as my email does not allow me access to your site). They should all have the same role and be Active. Click Continue.  
Choose a Role for Participants  
Student - maintain  
Clara Buma (Brian Davis) - maintain  
Grad Chair - access  
AC faculty members - access
12. Choose access. Click Continue.
13. Do NOT send an email notification. Click Continue, click Finish. You are done setting up your individual student project site!

## Appendix II

### Objectives for the Astronomy Written Comprehensive Exam

To continue in the Astronomy PhD program, Phd students must demonstrate astrophysics competence at the undergraduate level by passing a written comprehensive exam of 8 -10 problems. The problems will be written to test specific problem-solving skills as listed in section

1. In the questions, students will be assumed to know the content and definitions as listed in sections 2 and 3.

#### 1. Skills

- (a) apply Newton's laws of motion and the universal law of gravitation to understand Keplerian motion and derive masses
- (b) apply the virial theorem to astrophysical systems (e.g., giant molecular clouds, globular clusters, galaxy clusters)
- (c) apply hydrostatic equilibrium to astrophysical systems
- (d) understand and apply the Planck equation, Stefan-Boltzmann's Law, and Wien's Displacement Law
- (e) understand and apply the Boltzmann (excitation) and Saha (ionization) equations
- (f) describe, recognize, and explain features in spectra, e.g., emission lines, absorption lines,

and continuum emission

- (g) derive the Strömngren radius from first principles
- (h) derive and compare common timescales (i.e., dynamical, Kelvin-Helmholtz, free-fall, nuclear)
- (i) estimate lifetimes for astrophysical systems based on energy considerations
- (j) apply conservation laws of energy and angular momentum to constrain the properties of astrophysical systems
- (k) understand and apply the equation of radiative transfer to simple cases of the interaction of light and matter
- (l) understand and apply the four fundamental equations of stellar structure to simple situations
- (m) use rotation curves to constrain galaxy masses and dark matter content
- (n) apply Hubble's Law to determine distances to extragalactic objects and the age of the Universe
- (o) understand and apply the Friedman equations of physical cosmology
- (p) use magnitude units
- (q) translate common observables such as colour,  $u_x$ , and angular size to physical properties such as temperature, luminosity, age, or physical size
- (r) define telescope requirements (e.g., telescope diameter, wavelength coverage, sensitivity) to constrain physical properties of astrophysical systems

2. Content: familiarity with and understanding of the following topics will be assumed in the questions

- (a) atomic structure
- (b) the process of nuclear fusion (in the early universe and in stars)
- (c) electron/neutron degeneracy pressure
- (d) the physics of ideal gases: equation of state, pressure (gas and radiation), the Maxwell-Boltzmann velocity distribution
- (e) convective energy transport 1
- (f) the celestial sphere and coordinate systems
- (g) the gross properties of the solar system
- (h) the physics underlying the structure in an HR diagram
- (i) variable stars (Cepheids); binary stars (spectroscopic, eclipsing)
- (j) the evolution of stars as a function of mass including the end-states of stellar evolution
- (k) the observable effects (colour, luminosity, spectral features) of the aging of a stellar population over cosmic time
- (l) the structure and content of the Milky Way's interstellar medium, including interstellar dust
- (m) the baryonic and dark matter components of spiral galaxies such as the Milky Way
- (n) the fundamental differences between spiral and elliptical galaxies (stellar populations, gas content, dynamics, environments)
- (o) the supermassive black hole model for active galactic nuclei
- (p) the distance scale
- (q) the history of the early Universe (e.g., radiation- vs. matter-dominated phases); the significance of the cosmic microwave background radiation

3. Definitions

- (a) colour/effective/brightness/kinetic/excitation/ionization temperature
- (b) local thermodynamic equilibrium

- (c) luminosity, flux, flux density, specific intensity, surface brightness
- (d) mean free path, optical depth, emissivity, absorption/scattering cross section, absorption coefficient, opacity
- (e) column density, extinction, reddening, extinction curve
- (f) angular/spectral resolution
- (g) sidereal time, sidereal/solar day, sidereal/synodic period
- (h) parallax
- (i) magnetic flux
- (j) tidal/Schwarzschild radius
- (k) bolometric luminosity/correction
- (l) mass-to-light ratio ( $M=L$ )
- (m) metallicity
- (n) polytrope
- (o) Local Standard of Rest
- (p) redshift (cosmological vs. Doppler)

### Appendix III

#### Policy and Guidelines for Faculty Members in Employment and/or Supervisory Relationships with Graduate Research Assistants, Post-Doctoral Fellows and Other Research Collaborators

##### Preamble

As directed in the Letters of Understanding, section A. Academic Responsibilities of Members, Clause 5 f, a sub-committee of the Joint Committee was struck to develop and recommend policy and guidelines to support faculty members in employment and/or supervisory relationships with Graduate Research Assistants, Post-Doctoral trainees and other research collaborators and ensure that such relationships are carried out in accordance with the law and good academic practice.

We include here as Aresearch trainees@ undergraduate and graduate students working in a supervisory relationship with a faculty member, post-doctoral fellows and postdoctoral associates, and other research-related personnel, such as summer research students, research associates and graduate research assistants.

##### Statutory Obligations

The supervisor has a responsibility to be aware of, and adhere to, all legal and statutory obligations that govern the supervision of research trainees. These include relevant Collective Agreements between the University and specific employee groups, the Ontario Human Rights Code (<http://www.ohrc.on.ca/en/resources/code>), the Ontario Occupational Health and Safety Act ([http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90o01\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o01_e.htm)) and the Ontario Employment Standards Act:

([http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_00e41\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_00e41_e.htm)).

In particular, supervisors should be aware that there are provisions for many employee-related issues, including minimum wage, hours of work, termination procedures, and notification and severance obligations.

## Guidelines for Best Supervisory Practices

Notwithstanding that student supervision involves an interaction between two parties and that both parties bear some responsibility for the success of the relationship, the following guidelines are suggested as best practices for the supervisor.

The supervisor should strive to cultivate conditions that are favorable to the trainees' research and intellectual growth, and provide appropriate guidance on the progress of research and the standards expected. Good supervisory practice includes the following:

### Availability:

Be accessible, and provide advice and constructive criticism.

As appropriate, ensure that sufficient resources are available, including access to facilities and research materials, technical training and financial support.

Respond in a timely manner with comments/revisions to drafts of applications, reports or research presentations/publications.

Ensure continuity of adequate supervision of trainees during leaves or any extended period of absence

### Mentoring:

Provide appropriate guidance on the nature of research, research ethics, intellectual property rights, and academic integrity.

Establish a professional working relationship to guide the trainees' approach to research.

Assist the trainee with the selection and planning of a suitable and manageable research program.

Guide the trainee in learning to work independently and/or as a member of a team, as appropriate to the discipline.

Encourage and assist trainees to participate in programs for professional development, such as effective writing courses, teaching training programs, and workshops on research grants and conflict resolution.

Encourage and assist trainees in obtaining financial resources to attend and present their work at local, national and international conferences.

Encourage and assist trainees to publish or disseminate their work in appropriate venues.

Inform trainees when progress is unsatisfactory and advise them on what can be done to



improve it.

Maintaining a safe and professional workplace:

Avoid personal or business relationships that may constitute a conflict of interest.

Ensure that the research environment is safe, equitable and free from harassment and discrimination (see, for instance, the Articles, A Discrimination and Harassment@ in the Faculty Collective Agreement).

Give credit in an appropriate manner to trainees' contributions to scholarly activities, such as at professional meetings, in publications, in applications for grants or in performances or exhibitions