

GRADUATE STUDENT HANDBOOK

2021-2022

GRADUATE PROGRAM IN PHYSICS AND ASTRONOMY



September 2020

WELCOME MESSAGE

Welcome to the Graduate Program in Physics and Astronomy at York University. This handbook provides most of the information needed by new graduate students, so that you can rapidly orient yourself to the program environment. It will also be useful as a reference document as you pursue your graduate studies here.

We would appreciate your comments about the usefulness of this booklet and how it can be improved in the future. We would also like to thank everyone who has contributed to this handbook so far.

Best wishes for a productive and enjoyable journey through your studies here!

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RESEARCH AREAS AND FACILITIES

The Graduate Program in Physics and Astronomy focuses on a wide range of study and research in the following areas:

- Astronomy & Astrophysics
- Atomic, Molecular & Optical Physics
- Biological Physics
- Chemical & Condensed Matter Physics
- Earth, Atmospheric, Space & Engineering (Planetary Physics)
- High Energy & Particle Physics

The research is carried out in modern laboratory buildings. The Petrie Science and Engineering Building (PSE) houses the Department of Physics and Astronomy. It is well equipped with research support facilities, such as stores (PSE 002), a machine shop (PSE 006), drafting and photography facilities, an electronics shop (PSE 018A), a glassblowing shop (PSE 016) and, of course, numerous powerful computing facilities. The Steacie Science Library is located just east of PSE.

WHOM TO SEE ABOUT WHAT

Question About?	Name	Office	Telephone/Email
Emergencies (Ambulance, Fire, Police)			911
On-campus Security, URGENT	Security Control Centre		33333 or 416-736-5333
On-campus Security	Security Control Centre		58000 or 416-650-8000
Student Security Escort Service	York goSAFE Program		416-736-5454
Network connection, computer advice and accounts	Jamshid Bahramian, Juan Lemus	322 Lumbers	30758/fscits@yorku.ca
General administration, services, space, furniture	Cristalina del Biondo	125 PSE	20604/delbiond@yorku.ca
	Janaki De Camillis	128 PSE	55249/janakiw@yorku.ca
Expense Reports, Purchase Requisitions	Cristalina del Biondo	125 PSE	20604/delbiond@yorku.ca
	Janaki De Camillis	128 PSE	55249/ janakiw@yorku.ca
Health and Safety	Brad Sheeller	317 Lumbers	647-999-9806/ sheeller@yorku.ca
Keys (office and building), Department photocopier	Cristalina del Biondo	128 PSE	20604/delbiond@yorku.ca
	Janaki De Camillis		55249/janakiw@yorku.ca
Teaching Assistantships	Matt George	113 PSE	22859/mgeorge@yorku.ca
TA payments	Cristalina del Biondo	125 PSE	20604/delbiond@yorku.ca
Stores	Sherryl Dean Amal Youssef	002 PSE	55244/scistore@yorku.ca
Room bookings, Departmental projector	Janaki De Camillis	128 PSE	55249/ janakiw@yorku.ca
	Cristalina del Biondo	125 PSE	20604/delbiond@yorku.ca
Other	Matthew Johnson	322 PSE	33747/phasgpd@yorku.ca

GENERAL INFORMATION

The information in this handbook is supplementary to that found on the [Faculty of Graduate Studies \(FGS\) website](#) and the [Program website](#). New students should familiarize themselves with the FGS policies and procedures, which can be found [here](#). In particular, please review the [Code of Student Rights and Responsibilities](#) and the [Senate Academic Honesty policy](#) regarding cheating, plagiarism, impersonation, improper research and publication practices, etc.

Students are advised to follow registration dates and Program and Faculty deadlines. In addition, please inform the Graduate Program Assistant of any changes in status or study plans in order to ensure that the correct procedures are followed to avoid administrative havoc in the future.

Students should frequently check their YorkU email for important announcements and deadlines, scholarship notices, bursary applications, etc. If applicable, the mailboxes located outside 211 Petrie Science Building (PSE) should also be regularly checked for notices and other program information.

2021 – 2022 IMPORTANT DATES

Please refer to the following website for information on all the important dates for the Faculty of Graduate Studies:

<http://gradstudies.yorku.ca/current-students/student-status/important-dates/>.

Important Departmental dates will be sent to you by email from the Graduate Program Office.

ORIENTATION

FGS Grad Social for new graduate students, September 7, 2021 from 12:00-1:30 PM:

<https://gradstudies.yorku.ca/incoming-students/grad-social/>

A virtual orientation session for Physics and Astronomy students will be held Thursday, September 2, 2020 from 10:30-12:30. If you missed it, the slides can be obtained upon request.

Support for new TA's is offered by the Teaching Commons:

<https://www.yorku.ca/teachingcommons/graduate-students/>

In particular, you may find the online orientation modules useful:

<https://www.yorku.ca/teachingcommons/ta-orientation/>

The following online courses are mandatory before starting your TA duties:

Health and Safety orientation (first module only):

<https://moodle.yorku.ca/moodle/course/view.php?id=36422>

Electrical Safety Awareness

<https://moodle.yorku.ca/moodle/course/view.php?id=66126>

WHMIS I:

<https://moodle.yorku.ca/moodle/course/view.php?id=113973>

Laser Safety (held in-class)

REGISTRATION PROCEDURES AND DEADLINES

All graduate students must register for the fall, winter and summer terms (except for coursework students who normally only register for fall and winter). All students require permission to register in courses.

REGISTRATION DEADLINES:

<http://gradstudies.yorku.ca/current-students/student-status/important-dates/>

All students expecting to receive an assistantship must register Full-Time by the deadlines. Students cannot get paid until registration has been completed.

Graduate students are required to register in each term until the completion of their degrees as either a full-time or a part-time student. Please note that dropping courses does not automatically indicate that a student has withdrawn from the program. In order to withdraw from the Faculty of Graduate Studies, students must submit a letter to the Graduate Program Office. The effective date of withdrawal is the date the letter is received.

Students should consult with their supervisor before selecting and enrolling in their courses. M.Sc. coursework students should meet with the Graduate Program Director (GPD) for advising. **Students wishing to drop a course require permission from their supervisor (GPD for coursework students).**

Students may seek approval to take up to one full graduate course outside the Program or to take a Reading course. Requests to take a course outside York University can only be granted in very special cases. More information about these possibilities can be obtained from the Graduate Program Office (125 PSE).

WHAT'S NEXT?

York Identity Cards: YU-cards can be obtained from the YU-card Office in 200 William Small Centre. For more information, visit <http://www.yorku.ca/yucard>.

Email Policy: To activate your YorkU email account, go to:
<http://myonlineservices.students.yorku.ca>

FORMS

Some of the forms you may need to submit at various stages of your graduate career can be found at

<http://gradstudies.yorku.ca/current-students/student-status/forms/>,
<http://gradstudies.yorku.ca/current-students/student-finances/forms/>
<http://gradstudies.yorku.ca/current-students/thesis-dissertation/forms/>

and [here](#).

FEES

Graduate fees are calculated according to a student's program and full-time or part-time enrolment status. Fees are not calculated on a per-course basis.

Fees are based on three terms of full-time study from September through August. For more details and information about supplementary and additional charges, please visit <http://sfs.yorku.ca/fees/courses/index.php>. Information about the Student Choice Initiative and the opt-out process for supplementary fees is given [here](#).

Fees Paid by an Employer, Government or an External Agency (Third Party Billing): If your tuition fees are being paid directly to the University by a third party (e.g., employer, government, Embassy, etc.) you must submit your sponsorship letter to the Office of Student Financial Services (for contact information, visit <http://sfs.yorku.ca>) immediately following registration. Please note that you are still responsible for all charges on your student account, and late charges or other sanctions will apply if the account is not settled promptly. Your account will not be credited until payment has been received.

Graduate Students who have an outstanding financial debt to the University of \$1,000 or greater will be blocked from registering. If this is the case, students are strongly encouraged to pay down their debts or speak with someone in the Student Affairs Office of the Faculty of Graduate Studies (230 York Lanes) before the beginning of the term PRIOR TO the registration deadline.

REFUND TABLES

Students are responsible for tuition fees in all terms until completion of all degree requirements, including submission of the final thesis or dissertation copies to the Faculty of Graduate Studies. Graduate fees are calculated according to a student's program and full-time or part-time enrolment status. Fees are not calculated on a per-course basis. A student who withdraws from FGS may receive a partial fee refund. Fee refunds/credit calculations are based on complete withdrawal from a term, not withdrawal from an individual course. In order to withdraw from the Faculty of Graduate Studies, students must submit a letter to the Graduate Program Office. The effective date of withdrawal is the date the letter is received. Withdrawal dates and refund amounts can be found at the following link: <http://sfs.yorku.ca/refunds/tables/>.

Please note that students must first satisfy the requirements of paying for the minimum number of terms for their particular program of study before any refunds will apply. M.Sc. students must pay fees for a minimum of 3 terms of full-time study (or 6 terms of part-time study). Doctoral students must pay fees for a minimum of the equivalent of six terms of full-time registration (or 12 terms of part-time registration).

GRADUATE INCOME INFORMATION

The Faculty of Graduate Studies has changed the funding model for graduate students as of Fall 2016. Please visit <http://gradstudies.yorku.ca/graduate-funding-model> to learn more about graduate funding at York.

Full-time Physics and Astronomy (PHAS) students may receive a combination of:

- **York Masters/Doctoral Fellowships:** This component was introduced across the board in 2016 to offset tuition fees.
- **Teaching Assistantships:** PHAS graduate students normally engage in assigned teaching-related work (laboratory demonstration, marking, invigilation) up to one full TA, subject to availability. At York University, one full TA is 270 hours. The normal annual TA in Physics in Astronomy is 202.5 hours of teaching-related duties (75% of a full TA). Teaching Assistants are represented by CUPE 3903. Please familiarize yourself with the [CUPE 3903 Collective Agreement](#).
- **Research Assistantships:** PHAS graduate students in research degree programs (i.e., M.Sc. project, M.Sc. thesis or Ph.D.) typically receive financial support from their supervisors' research grants, the amount of which is subject to individual discussion between the student and supervisor. Other than

participation in research activities, there is no formal duty associated with this support.

- **International Tuition Fee Scholarships:** While the ITFS program was terminated in 2014, existing international students already holding an International Tuition Fee Scholarship can expect to keep it for the duration of their degree program.
- **York University Graduate Scholarship (YGS):** The Graduate Program in Physics and Astronomy offers York Graduate Scholarships to incoming students. This award is usually only available to applicants with an A average and is not renewable.

External Scholarships: York University students may receive national scholarships from the Natural Sciences and Engineering Council of Canada (NSERC) valued at \$17,500-\$35,000 a year, or provincial scholarships, such as the Ontario Graduate Scholarship (OGS) and Queen Elizabeth II (QEII) scholarship, valued at \$15,000. These scholarships are awarded on a competitive basis. Students who satisfy the eligibility requirements are encouraged to apply for these scholarships, which are described in more detail below. For complete information on deadlines, procedures and eligibility requirements, please visit <http://gradstudies.yorku.ca/current-students/student-finances/funding-awards>

NSERC Scholarships

Natural Sciences and Engineering Research Council (NSERC) Graduate Scholarships are intended to provide financial support to excellent students who are working towards a Masters or Doctoral program in the natural sciences or engineering.

Applications are available online: http://www.nserc-crsng.gc.ca/Students-Etudiants/PG-CS/index_eng.asp. **Deadlines: Around Oct 7, 2021 for PhD (transcripts are due on Oct 1) and Dec 1, 2021 for MSc students.**

Eligibility to apply: Applicants must be Canadian citizens or permanent residents of Canada; intend to pursue in the following year full-time graduate studies and research at the Masters or Doctoral level in an eligible program in one of the areas of the natural sciences and engineering supported by NSERC; and have obtained a first-class average (a grade of "A-") in each of the last two completed years of study, regardless of the number of credits completed.

OGS

The Ontario Graduate Scholarship (OGS) program is designed to encourage excellence in studies at the Masters and Doctoral levels. An OGS is awarded for one academic year, which may consist of three consecutive terms. One-term awards are not granted.

OGS deadlines are synchronized with NSERC deadlines:

M.Sc. level: Around December 1, 2021

Ph.D. level: Around October 7, 2021 (transcript are due earlier)

More information and the application forms are available at:

<http://gradstudies.yorku.ca/current-students/student-finances/funding-awards/ogs/>.

Please contact the Graduate Program Assistant for more information.

Other sources of funding that may be available:

- The Fieldwork Cost Fund defrays the costs of carrying out field-work.
- The CUPE 3903 Research Cost Fund defrays the out-of-pocket costs of carrying out research, for example, travel to sources of research, payment of subjects, supplies, services, photocopying, etc.
- The Graduate Development Fund defrays travel costs to present results at conferences.

Please visit

<http://gradstudies.yorku.ca/current-students/student-finances/funding-awards/>

or contact the Graduate Program Assistant for more information.

Benefits

- Teaching Assistants (members of CUPE 3903 unit 1) enjoy a number of health-related benefits (dental, prescription drug, and vision care).
 - York Benefits office expects all new TAs to enrol in the first month; otherwise your benefits will not be active. Benefit information can be found on the [CUPE websites](#).
- International students receive a bursary to cover the cost of the university health insurance plan (UHIP). Information about UHIP can be found at: <http://yorkinternational.yorku.ca/uhip/>

GRADUATE COURSES

The PHYS graduate courses offered in 2021-2022 are¹:

COURSE NO.	TITLE	PROFESSOR	DAYS	TIMES	ROOM	CAT. NO.
PHYS 5000 3.0 FALL	Quantum Mechanics 1	M. Horbatsch	M-W-F	10:30	LUM 306	R08R01
PHYS 5020 3.0 WINTER	Electromagnetism	N. Bozorgnia	M-W-F	12:30	In person	V76Z01
PHYS 5030 Fall	Statistical Mechanics	W. van Wijngaarden	M-W-F	8:30	Remote	M06Z01
PHYS 5040 3.0 WINTER	Elementary Particle Physics	W. Taylor	M-W-F	11:30	In person	F29G01
PHYS 5050 3.0 WINTER	Atomic and Molecular Structure	T. Kirchner	M-W-F	13:30	In person	Z79V01
PHYS 5061 3.0 FALL	Experimental Techniques in Laser Physics	C. Storry	W	14:30	In person	
PHYS 5061 3.0 WINTER	Atom Trapping	C. Storry	M	15:30	In person	
PHYS 5070A 3.0 FALL	Advanced Numerical Method	D. Liang	T-R	14:30	Remote	P46Y01
PHYS 5070B 3.0 WINTER	Numerical Sol. To PDEs	M. Haslam	M-W	13:00	In person	X99B01
PHYS 5090 3.0 WINTER	Stars & Nebulae	A. Muzzin	M-W-F	14:30	In person	F00Z01
PHYS 5100 3.0 WINTER	Solid State Physics	W.van Wijngaarden	M-W-F	10:30	In person	Y53F01
PHYS 5180 3.0 WINTER	Quantum Field Theory 1	R. Lewis	T-R	10:00	In person	S64D01
PHYS 5230 3.0 FALL	General Relativity & Cosmology	S. Rastgoo	M-W	14:30	Remote	G69Z01
PHYS 5290 3.0 FALL	Extragalactic Astronomy	P. Hall	M-W	12:30	LUM 306	E02M01
PHYS 5400 3.0 FALL	Physics Research	INDEPENDENT READING FALL	n/a	n/a	n/a	Z75D01
PHYS 5400 3.0 WINTER	Physics Research	INDEPENDENT READING WINTER	n/a	n/a	n/a	X22M01
PHYS 5490 3.0 FALL	Astronomical Research	INDEPENENT READING FALL	n/a	n/a	n/a	T83Y01
PHYS 5490 3.0 WINTER	Astronomical Research	INDEPENDENT READING WINTER	n/a	n/a	n/a	N30U01
PHYS 5590 3.0 WINTER	Observational and Theoretical Cosmology	N. Bozorgnia	T-R	13:00	In person	P23A01
PHYS 5802 3.0 WINTER	Cellular Electrodynamics	C. Bergevin	M-W-F	12:30	In person	X70J01
PHYS 5850 3.0 WINTER	Harmonic Analysis and Image Processing	H. Zhu	T-R	10:00	In person	R75P01
PHYS 6001A 3.0 WINTER	M.Sc. Research Evaluation	MSC 1	n/a	n/a	n/a	G77G01
PHYS 6001B 3.0 WINTER	M.Sc. Research Evaluation	MSC 2	n/a	n/a	n/a	A24P01
PHYS 6001C 3.0 WINTER	M.Sc. Research Evaluation	MSC 3	n/a	n/a	n/a	U99C01
PHYS 6060 3.0 FALL	Advanced Topics in Theoretical Physics: Machine Learning	J. Zylberberg	M-W-F	11:30	LUM 306	U49U01
PHYS 6140 3.0 WINTER	Advanced Topics in Particle Physics	D. Harris				
PHYS 6190 3.0 WINTER	Long Baseline Interferometry	N. Bartel	T-R	10:00	In person	Z65Q01
PHYS 6412 1.0 WINTER	Select Topics in Astronomy	C. Marsan	M-W-F	10:30	In person	
PHYS 7001A 3.0 WINTER	Ph.D. Research Evaluation	PhD 1	n/a	n/a	n/a	K18J01
PHYS 7001B 3.0 WINTER	Ph.D. Research Evaluation	PhD 2	n/a	n/a	n/a	D65S01
PHYS 7001C 3.0 WINTER	Ph.D. Research Evaluation	PhD 3	n/a	n/a	n/a	U12D01

¹ This list is subject to minor changes during the Fall term.

PHYS 7001D 3.0 WINTER	Ph.D. Research Evaluation	PhD 4	n/a	n/a	n/a	R00P01
PHYS 7001E 3.0 WINTER	Ph.D. Research Evaluation	PhD 5	n/a	n/a	n/a	K47B01
PHYS 7001F 3.0 WINTER	Ph.D. Research Evaluation	PhD 6	n/a	n/a	n/a	U41S01
PHYS 7001G 3.0 WINTER	Ph.D. Research Evaluation	PhD 7	n/a	n/a	n/a	E23C01

Every year the Department of Physics and Astronomy offers a selection of the graduate courses listed [here](#). Students have the option of taking a course in other science-related graduate programs, subject to approval by the GPD.

COURSE EVALUATIONS

Course evaluations are conducted by the Graduate Program Office each year for all of the Physics and Astronomy graduate courses offered.

GRADING OF GRADUATE COURSES

A+	90-100%	Exceptional
A	85-89%	Excellent
A-	80-84%	High
B+	75-79%	Highly Satisfactory
B	70-74%	Satisfactory
C	60-69%	Conditional
F	0-59%	Failure
I		Incomplete

Note that the grading scheme for graduate courses will change in Fall 2023 to include a B- . Important information about graduate courses can be found [here](#). In particular, please note the FGS Academic Standing regulations:

Combinations of ‘C’ Grades Which Require Withdrawal Unless Continued Registration is Recommended and Approved

A student who received in total any of the following combinations of grades for graduate courses may not continue to be registered in the Faculty of Graduate Studies and in a graduate program unless this continuation is recommended by the graduate program director concerned and approved by the Dean:

- (a) two C grades for 6.00 credit courses;
- (b) one C grade for a 6.00 credit course and one C grade for a 3.0 credit (or equivalent) course;
- (c) a total of three C grades for 3.0 credit (or equivalent) courses.

In no cases will grades be averaged.

Combination of 'F' and 'C' Grades Which Require Withdrawal

A student will be required to withdraw from a graduate program and registration in the Faculty of Graduate Studies will be terminated if the student receives in total for graduate courses, during enrolment at York University:

- (a) one F grade for a 6.00 credit course or two F grades for 3.0 credit (or equivalent) courses; or
- (b) one F grade for a 3.0 credit (or equivalent) course and one C grade for a 6.00 credit or 3.0 credit (or equivalent) course.

In no case will grades be averaged.

DEGREE REQUIREMENTS

MASTER OF SCIENCE PROGRAM

There are three routes by which a student may achieve an M.Sc. degree in Physics and Astronomy: by research thesis, research project or by coursework. For more information about the requirements for each M.Sc. degree, please visit <http://www.physics.yorku.ca/msc-degree/>.

DOCTOR OF PHILOSOPHY PROGRAM

The requirements of the Ph.D. program are described [here](#).

Please also see the attached "Calendar" which nicely summarizes the requirements for various degrees in the Physics and Astronomy graduate program.

ANNUAL RESEARCH EVALUATION

The M.Sc. project, M.Sc. thesis and Ph.D. supervisory committee must meet with the student at least once a year to assess the student's progress in the program, and to provide advice on future work. Please review the [Annual Research Evaluation Procedures](#). The student should print a copy of the [Annual Research Evaluation Form](#) and bring it to the committee meeting.

THE PROCESS FOR APPROVAL OF AN M.SC. THESIS/PH.D. DISSERTATION

Congratulations! You have finished your research and documented it in an M.Sc. thesis/Ph.D. dissertation. This is the timetable to be followed for the completion of your degree requirements. It takes at least six/seven weeks from possession of a “final” copy of the thesis/dissertation to completion of the examination process.

WHEN (M.SC./PH.D.)	WHAT	WHO
At least three months/six months before the oral exam	Submits thesis/dissertation proposal to Graduate Program Office.	Student
Six weeks/seven weeks before the oral exam	Submits a soft or hard copy (as required) of the thesis/dissertation to all Supervisory Committee members for review.	Student
At least six/seven weeks before the oral exam	Forms Examining Committee. Submits information to the Graduate Program Office.	Supervisor
	Schedules the public lecture and oral exam and completes Recommendation for Oral forms.	Graduate Office
Four weeks/five weeks before the oral exam	Signs off on thesis/dissertation as Examinable.	Supervisory Committee
Four weeks/five weeks before the oral exam	Receives edited thesis/dissertation from Supervisory Committee.	Student
At least 15/20 business days before the oral exam	Submits a soft or hard copy (as required) of corrected thesis/dissertation to all Examining Committee members for review.	Student/ Graduate Office ²
	Completes Oral Exam forms.	Student
Final oral exam	Presents public lecture and oral defence.	Student
Anytime after oral exam	Submits corrected copy of thesis/dissertation with required forms to FGS.	Student

Project M.Sc. students have to submit a project report to their supervisory committee at least two weeks prior to the intended completion date. A hard copy of the report and the completed project M.Sc. form must be submitted to the Graduate Office by the intended completion date.

² The student supplies all Examining Committee members with the thesis/dissertation with one **exception**: Since a PhD candidate is not supposed to communicate with the external examiner before the defence, the Graduate Program Office submits the dissertation to the external.

GRADUATE RESOURCES

PHYSICS AND ASTRONOMY COLLOQUIUM

On most Tuesdays during the academic year at 2:30 pm, the Physics and Astronomy Colloquium is held in 317 PSE. These colloquia offer an outstanding roster of speakers who provide an expert view of research advances in the various fields of Physics and Astronomy. The lecturers are requested to aim their presentation to Physics and Astronomy graduate students and senior undergraduate students. **Regular attendance at these colloquia is highly recommended as part of all students' education.** Coffee and cookies are served in 317A PSE before or after the colloquium. If, in the course of your activities, you hear someone and think "they would be really good as a colloquium speaker", then let the Colloquium Chairs (N. Bozorgnia, x66480, nassimb@yorku.ca, C. David, x22855, claired@yorku.ca) know so they can be invited.

LIBRARIES

There are five main libraries at York: Steacie Science and Engineering Library, Scott Library (social sciences and humanities), Peter F. Broffman, Leslie Frost Library and Law Library. The Steacie Science Library subscribes to significant physics, astronomy, biophysics, materials science, engineering and chemical physics journals and provides electronic access to most of these. It also holds extensive collections of back issues (and books!). Information about library services and training can be found on the [library website](#). Graduate students may apply for extended loan privileges by submitting a signed letter from the department that they are currently working on a Masters or Doctoral thesis.

WRITING

The Writing Centre offers sessions and workshops in all aspects of writing. Sessions such as individual tutoring, drop-in-tutoring and group workshops are available to all students in the Faculty of Graduate Studies. The Centre is located in Ross South 311. See its [website](#) for more information.

ENGLISH AS A SECOND LANGUAGE CENTRE

The English as a Second Language Open Learning Centre (ESL-OLC) is open to all York students and offers support for ESL students. It is located in Ross South 311. For more information or to register, go to <http://www.yorku.ca/eslolc/>.

GRADUATE STUDENT ASSOCIATION (GSA)

<http://www.yugsa.ca>

CUPE 3903

<https://3903.cupe.ca>

PHYSICS AND ASTRONOMY GRADUATE EXECUTIVE (PAGE)

<http://page.physics.yorku.ca/>

SUMMARY OF STUDENT SUPPORT SERVICES

Office or Contact	Primary Service(s)
Career Centre 202 McLaughlin College 416-736-5351 http://careers.yorku.ca career@yorku.ca	Career counselling; Learning skills development workshops; Virtual resources; Internships
Centre for Student Community & Leadership Development (SC&LD) S172 Ross Building 416- 736-5144 http://sclld.yorku.ca	Enrich student life by promoting education, awareness and growth; celebrating diversity, encouraging collaboration and developing citizenship.
Student Counselling and Development N110 Bennett Centre for Students Service 416-736-5297 http://counselling.students.yorku.ca/	Personal counselors, crisis counseling, group development workshops, learning skills training, and support for learning disabilities and psychiatric disabilities
Centre for Human Rights, Equity & Inclusion 2070 Victor Phillip Dahdaleh Building 416-736-5682 http://rights.info.yorku.ca rights@yorku.ca	Assists individuals and groups to address and resolve allegations of discrimination and harassment as defined by the Ontario Human Rights Code (Code).
Office of the Ombudsperson 1050 York Research Tower 416-736-2100 x22937 http://ombuds.info.yorku.ca ombuds@yorku.ca	Provides an impartial and confidential service to assist current members of York University who have been unable to resolve their concerns about University authorities' application of York University policies, procedures and/or practices.
Office of the Registrar Bennett Centre for Student Services 416-736-YORK http://www.registrar.yorku.ca	Enrolment procedures; Sessional dates and refund table; Petitions, permission to take a course at another university, transcripts, and most forms
Faculty of Graduate Studies 230 York Lanes 416-736-5521 http://gradstudies.yorku.ca	Faculty policies and procedures; General advising, course selection/changes.
Sexual Assault Survivor's Support Line B449 Student Centre 416-736-2100 x 40345 http://sassl.info.yorku.ca	Provides unbiased and non-judgmental peer support and referrals to survivors of sexual violence, educational workshops and other supports
Student Financial Services N201 Bennett Centre for Student Services 416-872-YORK http://sfs.yorku.ca	Scholarships, financial problems, OSAP information
GSA Health Plan 325 Student Centre 416-736-5213 http://www.yugsa.ca	Health plan sponsored by Graduate Student Association

GRADUATE FACULTY MEMBERS

NAME	OFFICE	PHONE (416) 736- 2100	EMAIL
Bartel, Norbert	331 PSE	55424	bartel@yorku.ca
Beattie, Scott	N/A	N/A	Scott.Beattie@gmail.com
Bergevin, Christopher	240 PSE	33730	cberge@yorku.ca
Bhadra, Sampa	235 PSE	22470	bhadra@yorku.ca
Bietenholz, Michael		60259	mbieten@yorku.ca
Bisnath, Sunil	129 PSE	20556	sbisnath@yorku.ca
Bozorgnia, Nassim	219 PSE	66480	nassimb@yorku.ca
Campeanu, Radu	3059 DB	30105	campeanu@yorku.ca
Chen, Jennifer	456 CB	22339	jilchen@yorku.ca
Cooper, Thomas	435C BRG	22700	tcooper@yorku.ca
Daly, Michael	480 PSE	22066	dalym@yorku.ca
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Building acronyms:

- BRG Bergeron Centre for Engineering Excellence Building
- CB Chemistry Building
- DB Dahdaleh Building (formerly TEL)
- FS Farquaharson Building
- LAS Lassonde Building
- LMB Lumbers Building
- LS Life Sciences Building
- PSE Petrie Science and Engineering Building
- R Ross Building

PHYSICS & ASTRONOMY

In the Department of Physics & Astronomy, research is conducted in the general areas of astronomy and astrophysics, atomic, molecular and optical physics; biological physics; chemical and condensed matter physics; earth, atmosphere, space science and engineering; and high energy and particle physics. This research forms a major part of the Graduate Program in Physics & Astronomy, which is structured to permit students to select either a specialized research-oriented activity within the areas of Physics and Astronomy listed above, or to choose a more interdisciplinary program in collaboration with industry or the interdisciplinary centres at York University in fields such as atmospheric chemistry, mass spectrometry and vision research. The Graduate Program in Physics & Astronomy is located in the Petrie Science & Engineering Building. Major specialized research equipment, computing facilities and comprehensive technical support services are located in the building. The science library and further computing facilities are located in an adjacent building.

APPLICATION PROCEDURE

Applications are accepted at any time but first consideration is made for files completed by the deadlines published online at <https://futurestudents.yorku.ca/graduate/programs/physics-and-astronomy>; applications are available online. Prospective students may also request a hard copy application form from: Graduate Program Director of Physics & Astronomy, York University, 4700 Keele Street, Toronto, Ontario, M3J 1P3, Canada, <http://www.physics.yorku.ca>, gradphas@yorku.ca.

Completed application forms, letters of recommendation from referees, and up-to-date transcripts are reviewed by the Graduate Program in Physics & Astronomy and admissions are made to the program on a competitive basis.

MASTER OF SCIENCE PROGRAM ADMISSION REQUIREMENTS

Graduates with a bachelor's degree in engineering physics or an honours degree in physics or astronomy, or an equivalent degree, from a recognized university with at least B+ standing, may be admitted as candidates for the MSc degree.

QUALIFYING YEAR

Graduates in pure or applied science without the appropriate background in honours level physics and with at least B+ standing from a recognized university may register as a Special Student at the undergraduate level during a makeup year to raise their level to the minimum admission level required of candidates for the MSc degree. ❖ *Note:* Successful completion of studies as a Special Student at the undergraduate level does not guarantee admission to the graduate program.

DEGREE REQUIREMENTS

MSc Degree by Thesis

Candidates for the MSc degree by thesis in either the Physics or Astronomy and Astrophysics Stream must fulfil the following requirements:

1. Courses

a) All entering students plan a research program with their supervisor at the start of their degree studies. Progress in research is

monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper and an oral presentation each year. In the event of failure to achieve satisfactory progress the student will normally be required to withdraw from the program. Satisfactory progress in research results in credit for **Physics & Astronomy 6001 3.0: MSc Research Evaluation**.

b) In addition to the **Research Evaluation**, candidates must successfully complete a minimum of **9 course credits**, or equivalent. Courses must be selected in consultation with the candidate's supervisor.

Courses must include:

Physics Stream

One half-course (3 course credits) chosen from:
Physics & Astronomy 5000 3.0: Quantum Mechanics I, and,
Physics & Astronomy 5020 3.0: Electromagnetism.

To complete course requirements, candidates must select **an additional 3 course credits** from the Graduate Program in Physics & Astronomy. The remaining **3 course credits** may be selected from the Graduate Programs in Physics & Astronomy or other science-related graduate programs. **At least 6 course credits must be from courses not integrated with an undergraduate course.**

Astronomy and Astrophysics Stream

Physics & Astronomy 5090 3.0: Stars and Nebulae or its equivalent and **one half-course** chosen from among:
Physics & Astronomy 5000 3.0: Quantum Mechanics; **Physics & Astronomy 5020 3.0: Electromagnetism**; **Physics & Astronomy 5030 3.0: Statistical Mechanics**; **Physics & Astronomy 5120 3.0: Gas and Fluid Dynamics**; and, **Physics & Astronomy 5230 3.0: General Relativity**.

To complete course requirements, candidates must select **an additional 3 course credits** from the Graduate Programs in Physics & Astronomy or other science-related graduate programs. However, any candidate who lacks background in observational and/or theoretical methods of astronomy should consider taking **Physics & Astronomy 5390 3.0: Astronomical Techniques**.

2. Thesis and Oral Examination

Candidates must conduct research under the general direction of a supervisor and supervisory committee and describe it in an appropriate thesis. The research and thesis should demonstrate the candidate's research ability in the area of investigation, and should normally be of such a standard as to warrant publication in the scientific literature. After the formal submission of the thesis, an oral examination, centred on the thesis research, is held. Prior to the oral examination each candidate delivers a formal public lecture describing his/her research work.

MSc Degree by Project

Candidates for the MSc degree by project in either the Physics or Astronomy and Astrophysics Stream must fulfill the following requirements:

1. Courses

- a) All entering students plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper and an oral presentation each year. In the event of failure to achieve satisfactory progress the student will normally be required to withdraw from the program. Satisfactory progress in research results in credit for **Physics & Astronomy 6001 3.0: MSc Research Evaluation**.
- b) In addition to the Research Evaluation, candidates must successfully complete **15 course credits**. Courses must be selected in consultation with the candidate's supervisor.

Courses must include:

Physics Stream

Physics & Astronomy 5000 3.0: Quantum Mechanics I and Physics & Astronomy 5020 3.0: Electromagnetism.

To complete the remaining course requirements, candidates must select at least **3 course credits** from the Graduate Program in Physics & Astronomy, and another **6 course credits** may be selected from the Graduate Program in Physics & Astronomy or other science-related graduate programs. At least **7.5 course credits** must be from courses not integrated with an undergraduate course.

Astronomy and Astrophysics Stream

Physics & Astronomy 5090 3.0: Stars and Nebulae or its equivalent and one half-course chosen from among:
Physics & Astronomy 5000 3.0: Quantum Mechanics; Physics & Astronomy 5020 3.0: Electromagnetism; Physics & Astronomy 5030 3.0: Statistical Mechanics; Physics & Astronomy 5120 3.0: Gas and Fluid Dynamics; and, **Physics & Astronomy 5230 3.0: General Relativity.**

To complete the remaining course requirements, candidates must select at least **3 course credits** from the Graduate Program in Physics & Astronomy, and another **6 course credits** may be selected from the Graduate Program in Physics & Astronomy or other science-related graduate programs. Any candidate who lacks background in observational and/or theoretical methods of astronomy should consider taking **Physics & Astronomy 5390 3.0 Astronomical Techniques**. At least **7.5 course credits** must be from courses not integrated with an undergraduate course.

2. Research Project

Candidates must conduct research under the general direction of a supervisor and supervisory committee and describe it in a written report. The research and report should demonstrate the candidate's research ability in the area of investigation.

MSc Degree by Coursework

Candidates must successfully complete **24 course credits**, including a minimum of **9 course credits** per academic year. The progress of each coursework MSc student will be reviewed annually by the Executive Committee of the graduate program. In the event of failure to achieve satisfactory progress, the student will lose full-time status in the program.

Courses must include:

Physics & Astronomy 5000 3.0: Quantum Mechanics I and Physics & Astronomy 5020 3.0: Electromagnetism.

To complete course requirements, candidates must select **half of the remaining course credits** from the Graduate Program in Physics & Astronomy, and the remaining **course credits** may be selected from the Graduate Programs in Physics & Astronomy or other science-related graduate programs. At least **9 course credits** must be from courses not integrated with an undergraduate course.

PROGRAM ENTRY

The MSc program can be completed on a full- or part-time basis. Entry is fall, winter or summer term.

PROGRAM LENGTH

The expected degree completion time for full-time master's students is 6 terms. For those students who complete degree requirements earlier than 3 terms, they must register and pay fees for a minimum of the equivalent of 3 terms of full-time study. All requirements for a master's degree must be fulfilled within 6 terms for a full-time master's student or 12 terms for a part-time master's student in accordance with Faculty of Graduate Studies' registration policies.

DOCTOR OF PHILOSOPHY PROGRAM ADMISSION REQUIREMENTS

Graduates with a bachelor's degree in engineering physics or an honours BSc degree in physics or astronomy, or an equivalent degree, from a recognized university with at least B+ standing may be considered for admission to a program leading to the PhD degree. However, such graduates must first register as candidates for the MSc degree and are required, before entering the doctoral program, to demonstrate capability in several core areas of the Graduate Program in Physics & Astronomy. These areas depend on the research area of the student. If their progress is satisfactory, they may be transferred after one year into the PhD program and advance in status to candidates (PhD I) for the PhD degree on the recommendation of their supervisory committee and the Graduate Program Director.

Graduates with a Master's degree in physics, astronomy or engineering physics from a recognized university may be admitted as candidates (PhD I) for the PhD degree.

DEGREE REQUIREMENTS

Candidates for the PhD degree in either the Physics or Astronomy and Astrophysics Stream must fulfil the following requirements:

1. Courses

- a) All entering students plan a research program with their supervisor at the start of their degree studies. Progress in research is monitored by the supervisory committee through meetings with the student and by a progress report consisting of a written paper and an oral presentation each year. In the event of failure to achieve satisfactory progress the student will normally be required to withdraw from the program. Satisfactory progress in research results in credit for **Physics & Astronomy 7001 3.0: PhD Research Evaluation**.
- b) In addition to the Research Evaluation, candidates must successfully complete a minimum of **3 credits**, for a total of **18 credits** beyond the BSc. **Additional credits may be required, at the discretion of the Graduate Program Director or the supervisory committee.** Courses must be selected in consultation with the student's supervisor and based upon the area of research specialization.

Candidates must take the following courses if they have not already done so:

Physics Stream

Physics & Astronomy 5000 3.0: Quantum Mechanics I, and
Physics & Astronomy 5020 3.0: Electromagnetism.

Astronomy and Astrophysics Stream

Physics & Astronomy 5090 3.0: Stars and Nebulae or its equivalent; and one course chosen from among:
Physics & Astronomy 5000 3.0: Quantum Mechanics; **Physics & Astronomy 5020 3.0: Electromagnetism**; **Physics & Astronomy 5030 3.0: Statistical Mechanics**; **Physics & Astronomy 5120 3.0: Gas and Fluid Dynamics**; and, **Physics & Astronomy 5230 3.0: General Relativity**.

Any candidate who lacks background in observational and/or theoretical methods of astronomy should consider taking **Physics & Astronomy 5390 3.0: Astronomical Techniques**.

To complete the **18-credit** post-BSc course requirement, candidates must select half of the remaining credits from the Graduate Program in Physics & Astronomy. Remaining credits may be selected from the Graduate Program in Physics & Astronomy or other science-related graduate programs. At least **12** of the **18 credits** must be from

courses not integrated with an undergraduate course.

2. Dissertation and Oral Examination

Candidates must successfully complete a significant piece of research, under the general direction of a supervisor and a supervisory committee, and describe it in an appropriate dissertation. The research must be of such a standard that it would be acceptable for publication in the scientific literature. After the formal submission of the dissertation, an oral examination, centred on the dissertation-research is held. Prior to the oral examination each candidate delivers a formal public lecture on his/her research work.

PROGRAM ENTRY

The PhD program can be completed on a full- or part-time basis. Entry is fall, winter or summer term.

PROGRAM LENGTH

The expected degree completion time for a full-time Doctor of Philosophy student is 12 terms. Doctor of Philosophy students must register and pay fees for a minimum of the equivalent of six terms of full-time registration. All requirements for a doctoral degree must be fulfilled within 18 terms (6 years) of registration as a full-time or part-time doctoral student in accordance with Faculty of Graduate Studies' registration policies.