

## University of Rochester – PhD Optics- Assessment Plan

**A. Program title:** Optics

**B. Program degree:** PhD

**C. Program objectives and program learning outcomes:**

**Program objective 1. Program will prepare students of diverse technical backgrounds to carry out independent, creative research in to the multi-disciplinary field of optics**

1a. Core knowledge, methods, and scholarship: Students will demonstrate comprehensive, in depth knowledge of the core theories, methods, and scholarship in the field which can include quantum and atomic physics, electromagnetism, physical optics, math methods, instrumental optics, radiation and detectors, geometrical optics, solid state physics, optical materials, nonlinear optics, fiber and waveguides, optical spectroscopy, system analysis and tolerancing

1b. Specialization knowledge, methods, and scholarship: Students will demonstrate comprehensive, in depth knowledge of the theories, methods and scholarship within specialized area(s) chosen by student.

1c. Creative synthesis/ Critical thinking: Students will creatively synthesize broad areas of theory and scholarship in generation of new ideas or insights; Students will be able to critically analyze works in the field

1d. Research/ Methods: Students will conduct skillful research including gathering, processing, interpreting scholarship; Students will make considered choices in design of a research study; Students will precisely implement methods of analysis or investigation as part of research projects

1e. Scholarship: Students will produce original, scholarly contributions in their field

**Program objective 2. Program will prepare students to be successful as professionals in the field of optics or any field they choose to pursue**

2a. Written communication: Students will convey ideas or arguments in clear, concise, well organized papers

2b. Oral communication: Students will convey ideas in cogent, persuasive, and organized presentations

2c. Global citizenship/ broad impact: Students will demonstrate appreciation for one's role as a member of an increasingly connected global society: Student work will demonstrate awareness of its social, economic, technical, or ethical impact

2d Teaching: Students will present well organized lectures, classroom activities and assignments that support student learning

**D. Program assessment methods- direct methods**

The following methods will be implemented annually and for each doctoral degree candidate. Test results and faculty review forms for each method will be gathered in student file:

1. First Year GPA: As a formative assessment measure, students must maintain a grade of B or better in all required core courses in their first year in the program. Grade of B or better in all courses is required for student to sit for the Ph.D. preliminary exam. (PLO 1a)
2. Students choose to work in a lab on research with his/ her chosen advisor. Students must complete a Program of Study Form to be reviewed and critiqued by advisor. (PLO 1a, 1b, 1d)
3. Preliminary exam: Students complete a preliminary exam, generally in the 3<sup>rd</sup> term of graduate study. The 3 part, 9 hour exam tests student conceptual understanding of the core areas of the field of optics, analytical and critical thinking, and knowledge of research methods Faculty grades on each exam section must be passing scores. (program learning objective 1a, 1b, 1d).
4. Teaching Review: Students complete a teaching assignment. Students must receive a strong rating in faculty review of their teaching. (program objective 2d)

5. Oral Qualifying Exam: Students write a thesis proposal of 15-20 pages in length, and a 30 minute presentation. Proposal and presentation demonstrate student's conceptual understanding of the core and specialized field, of the breadth of pertinent literature pertinent to the project, and ability to develop a creative, original research problem that in uniquely draws on optics knowledge and research methods. Faculty assessment includes a written assessment (Form 2) and determination if student has passed exam. (program objective 1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c)
6. Annual Student Progress Report: Students complete an annual progress report in which he/she reports on research, publications, conference attendance, service, teaching. Student advisor reviews form and determines if student is making adequate progress toward graduation. (PLO 1e).
7. Thesis Advisory Committee Annual Review: Student must report progress to his/ her thesis committee. Faculty will advise on research project and student progress as a formative assessment measure. (program objective 1a, 1b, 1c, 1d, 1e)
8. Ph.D. Thesis and Final Oral Examination: Faculty thesis committee review of student's written dissertation, 1 hour public presentation, and oral examination. (PLO 1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c).
9. Awards, fellowships and other distinctions given by the program, University of Rochester, or external organization. (PLO 1a, 1b, 1c, 1d, 1e)
10. Refereed journal and conference publications- reported by graduate student to program (PLO 1a, 1b, 1c, 1d, 1e, 2a, 2b)
11. Data gathered on leadership positions held by enrolled students and alumni- reported by students and alumni to department (PLO 1c, 1e, 2a, 2b, 2c)

### **E. Program assessment methods- indirect methods**

The following indirect methods will be implemented as noted:

- (1) Graduate Student Survey will be a web based survey will be distributed (2012,2013, every other year after that) by the UR College Director of Assessment beginning in Spring 2012. The survey will also include questions that ask students to rate program quality and factors related to learning for communication, leadership, research and teaching.

1. Post-graduation career data- reported by students to department (PLO 1a, 1b, 1c, 1d, 1e, 2a, 2b, 2c, 2e)

**F. Program assessment data review plan (frequency of implementation)**

1. Data gathered in from grades, exams, forms, annual progress reports described above will be reviewed by the graduate program curriculum committee (annual).
2. Data gathered on academic warning, qualifying exam results, and degrees conferred will be tabulated by the Graduate Studies Office and reviewed periodically by the DGS.
3. Data gathered in Graduate Student Survey will be reported to the program curriculum committee by the College Director of Assessment, and reviewed by the DGS and graduate committee.