Optical Science and Engineering
M.S. and Ph.D.

optics.uncc.edu  adavies@uncc.edu

Presentation Information

• Program Overview
• Degree Requirements
• Timelines
• Things to keep in mind...
Charlotte is one of the few universities to offer graduate degrees in **Optical Science and Engineering**

**M.S. & Ph.D.**

**Optical Science and Engineering**

- Interdisciplinary and inter-departmental program
- Students work with faculty from Physics, ECE, ME, Chemistry
- Proper ‘home’ association is the Optics Center (Glenn Boreman, Dir.)

Program Director: Angela Davies, 235 Grigg, 7-8135, adavies@uncc.edu
Program Admin: Mark Clayton, Program Assistant, 7-8117, mclayton@uncc.edu
OSE program administrative support is through the Department of Physics and Optical Science

This means help with things like
- Completing forms for the graduate school
- Completing an OSE form (e.g. Plan of Study)
- Having holds lifted for adding classes
- TA contracts through the OSE program
- Qualifying exam information
- Setting dates and room reservations for Topic Approval and Dissertation Presentations.

First Contact Person:
Mark Clayton, 7-8117
mclayton@uncc.edu

Program Director:
Angela Davies, 7-8135
adavies@uncc.edu
Students go to their advisor’s home department for research-related administration.

Examples include:
- RA contracts
- Purchasing items through grants
- Travel authorization
- Travel reimbursement
- ...

Who do You Contact?

Ask your faculty advisor (varies with Department)

Example: Physics and Optical Science
Contact
Wendy Ramirez, 7-8132
wramire1@uncc.edu
Optics research at Charlotte is interdisciplinary and spans the range from Science to Engineering

**Science**
- Theoretical Optics
- Life Sciences
- Optical Materials
- Novel Light/matter Interactions
- Imaging

**Engineering**
- Biomedical Optics
- Optics Fabrication
- Precision Instrumentation
- Optical Sensors and Measurements

**Optoelectronic Materials**
- Optoelectronic Devices
- Micro-optics and Integrated photonics
OSE Research Opportunities are Diverse:

http://optics.uncc.edu/directory

Optical Engineering

Biomedical

Optics Fabrication

Precision Engineering

System Design

Optical Engineering

Biophysics

Optical Science

Devices

Optical Communications

Sources

Metrology
The optics program at Charlotte prepares you for a career in research and development.

Graduates are prepared for work in:

- Industry
- National Labs
- Academics
Official Degree Requirements

**MS Thesis Credits**
- 32 credits
- 5 Core Courses
- 2 Electives
- Seminar (2 credits)
- 9 Research Credit

**MS non-Thesis Credits**
- 32 credits
- Same as Above
- 9 Course Credits

**PhD Credits**
- 72 credits
- 6 Core Courses
- Electives
- Seminar ≥ 3 credits
- ~18 Open Credits
- 24 Research Credit
Official Degree Requirements: Ph.D.

Ph.D. degree candidate must

• Present evidence of competency in the Core Curriculum (no C’s, and passing the qualifying exam). Usually take 21 credits of core.

• Seminar (OPTI 8610) the first Fall in the program and complete 1 semester of Graduate Colloquium (OPTI 8611) during each academic year of residency in the program

• Complete a minimum of 6 credit hours in formal courses having an OPTI prefix in addition to the Core Curriculum

• Complete a minimum of 24 credit hours of dissertation research (OPTI8991)

• Present a Plan of Study detailing all course and examination requirements

• Successfully complete the written and oral qualifying exam

• Present a Ph.D. Research Plan

• Successfully defend the Ph.D. dissertation.
Official Degree Requirements: Courses

Core Courses

- OPTI 6/8101  Mathematical Methods of Optical Science and Engineering (Fall)
- OPTI 6/8102 + Lab  Principles of Geometrical (Fall)
- OPTI 6/8105 Optical Properties of Materials (Fall)
- OPTI 6/8106 + Lab  Principles of Physical Optics (Spring)
- OPTI 6/8103 Sources and Detectors (Spring)
- OPTI 6/8104 Electromagnetic Waves (Spring)

Elective Courses

- Many elective courses are ‘cross-listed’ with courses in other programs (e.g. PhD ME, PhD EE, ...). Enroll in the OPTI XXXX version.
- Talk to your advisor !!!
- Most students will need more than the minimum number of required electives.
- PhD students enroll in the 8xxx number for a course if possible.
Course and Dissertation Credit Timeline to the PhD

On GASP?
Need 9 Credits Fall and Spring Minimum
Milestone Timeline to the PhD

You Are Here
Pick Advisor (GSF)
Transfer Credits? (GSF, See Mark)
Pass Qualifier (GSF)
Complete Plan of Study (OSEF)

Walk Through Graduation
Apply Online to Graduate (GSF)
Defend Dissertation (GSF)

GSF = Graduate School Form Required
OSEF = OSE Program Form Only

1A → RA
Choose Committee (GSF)
(2 more people) (GSF)
Topic Approval (GSF)
OPTI 8610 and 8611 Timeline to the PhD

**You Are Here**

OPTI 8610
Meet at Scheduled
Class Time

OPTI 8611
Once per year
(Present at Grad. Coll.)

OPTI 8611
Once per year
(Present at Grad. Coll.)

OPTI 8611
Once per year
(Present at Grad. Coll.)

Walk Through
Graduation

Defend
Dissertation
(GSF)
Earn an MS non-thesis degree on the way to the PhD
Steps to applying to the MS OSE program:

Apply On-line to MS OSE Program

1. Apply to the MS OSE program through the Grad School ‘Apply Now’ site http://graduateschool.uncc.edu/admissions/apply-now.html
2. Put down Angela Davies, Mark Clayton, and Yasin Raja as your references.
3. Submit a Statement of Purpose that says the following: “I want to receive my MS degree as I work toward my PhD.”
4. Once your application is submitted, let Mark know (email).
5. Mark will have the Graduate School transfer your test scores and transcripts from your PhD application.
Extra Things to Consider

- **GASP:** In and Out of State Tuition support + Health Insurance
  - Must be enrolled in 9 credits min.
  - Must hold an assistantship (min $667/mo)
  - PhD students
  - Maximum 10 semesters (6 semesters if you come with an MS)
- US citizen: Failure to become a NC resident may lead to withdrawal of GASP (www.resdetermination.uncc.edu)
- PhD students enroll in 8xxx classes when possible (MS 6xxx)
- Check for cross-listing (enroll in the OPTI version when possible)
- TA Support: Not guaranteed after first year
  - First year students have priority, then 2nd year students, etc…
  - TA stipend goes to 7.5k per semester > year 1.
  - Expect to transition to a funded project at the end of year 1.
  - Go to advisor for support after 4 semesters of OSE TA support.
- Go to grad colloquium to learn about research areas (Thurs 12:30)
- Graduate catalog is right (http://catalog.uncc.edu/graduate-catalogs)
In your career, you can think of your technical work as involving ...

Defined by:
- Frequency content
- Polarization
- Phase (coherence)
- Energy
- Spatial extent
- Propagation

An Optical System

Optical Source → Light Modulator → Optical Processing → Transmission Medium → Optical Detector

Modifies Light Properties
What knowledge foundation do you need?

Core Courses: Materials, Geometrical, Physical, E&M, Sources and Detectors, Math
Core Courses

- Optical Properties of Materials
- Introduction to Geometrical Optics
- Introduction to Physical Optics
- E&M Waves
- Sources and Detectors
- Mathematical Methods

- You’ll need this broad ‘system-level’ perspective to be an effective researcher
- The focus of each class is ‘narrow’ in the context of system-level view
- Must learn to integrate into system-level perspective and critical thinking strategy
- Must learn to RECOGNIZE the UNDERLYING PHYSICAL PRINCIPLE at work and THEN the mathematical representation that will help you solve the problem
- Don’t miss any opportunity in courses to understand underlying physical principle…
- Frantically trying to recall the right equation from a databank of memorized equations won’t be effective...

Purpose of qualifier?...
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