Growth in Optics
Senior Design Class

#Students

- 6 teams in 2010
- 8 teams in 2011
- 11 teams in 2012
- 9 teams in 2013
- 8 teams in 2014
- 9 teams in 2015
- 11 teams in 2016
- 10 teams in 2017
Growth in Optics
Senior Thesis Class too

#Students

[Bar chart showing growth in OPT321 Senior Thesis from 2010 to 2017]
Fall semester Senior Design

• Fundamentals: How to Interview a potential Customer
  • In-class exercise WHK President of Zapp Photonics Intl. (ZAPPI)
• Interview customers
• Decide team project choices, submit essay
• WHK assign teams
• Assemble teams
• Start bi-weekly interviews with customers
• Determine Product Specifications, customer needs and wants
• Draft a Product Requirements Document
  • 1st, 2nd and 3rd revisions
  • Review in class every two weeks
• Final Product Requirements Document submitted by Teams
  • PRD includes draft timeline, project budget, equipment lists etc.
Team Proposals

• Formal Cover Letter
  • “Applying for the job”

• One-page CV
  • In my specific format

• Two-page essay
  • Three paragraphs
  • Detail first, second and third team project choices
  • Detail qualifications, motivation
  • Any suggested teaming
Important lessons (senior class)  
LAST CHANCE !!

• Favorite class questions include:

• “Prof. Knox, does the One Page Essay have to be one page ?”
  • YES of course !!!

• Assignment is due at 6:00pm ; “Prof. Knox, does 7:30pm submission constitute a late submission ?”
  • YES  0/15 points
Design Teams with Interdisciplinary Needs

Augment teams with Engineering Advisors

- Optical Engineering Seniors
- Mechanical Engineering Grad Student/Post Doc
- CS Junior Advisor
Interdisciplinary Parallel Teams

- Optical Engineering Team
- MechE or BME Engineering Team
- WHK
- Customer
- Customer Liaison
- Two coordinated deliverables!

+ Faculty Advisors, Junior Engineering Advisors, Grad Students and Post-Docs
Eleven Teams for 2017-2018:

- Vikram Dogra, M.D. and Dr. Navalgund Rao (URMC)
  - Aspheric Acoustic Fresnel Lenses for Photoacoustic Imaging of Thyroid Cancer
- Dr. Robert Hill, MD (Harmonigenic)
  - Second harmonic imaging system for metastatic breast cancer screening
- Dr. Tao Chen (ASML)
  - Optical source coherence length measurements system for lithography mask aligner
- Dr. Jennifer Kruschwitz (UR Optics)
  - System for accurate measurement of silicon dioxide film thickness using a two beam technique
Teams, (cont)

• Todd Blalock (Optimax)
  • Tolerancing and testing of a freeform monolithic telescope
• Russ Hudyma (Navitar)
  • Plenoptic imaging camera system image simulator and system design
• Calvin Uzelmeier (Rochester Museum and Science Center)
  • Design, fabrication and testing of a new Optics exhibit showcasing a Rochester Optics Company or a technology developed by a woman scientist
• Arnulfo Torres, RN
  • Novel optical system approach to quantitatively measuring the patient response in Tuberculosis testing
Teams (cont.)

• Dr. Ahmed Ghazi and Dr. Greg Schmidt (URMC/Optics)  Optics Mech E Double Team / possibly BME triple team
  • Near infrared light surgical trainer, design fabricate and test

• Dr. Brandon Zimmerman (NASA/DigitEyez)
  • Image simulator for vision testing to minimize autorefractor errors

• Dr. James Francis (Raptor startup)
  • Wide angle lens designs for high speed 360 degree Virtual Reality/Augmented Reality cameras
Senior Thesis Students OPT320

- Discuss research interests with WHK, develop list of five professors to interview
- Interview with five professors, take lots of notes
- Negotiate a position in a research group
- Write up one page CV, Research search summary, and formal cover letter applying for the position
- Fall semester – write a NSF-style thesis proposal
Senior Design/Senior Thesis
Intellectual Property track

• Reid Cunningham UR Ventures
  • Introduction to Patents, Copyrights and Trademarks
  • Patents and the Patenting Process
  • Finding Inventions in Your Work

• Patent Analysis Assignment
  • Read and understand a US Patent assigned
  • Eight recent patents in WHK chosen area
  • Patent Analysis
  • Summary statement – what the patent is all about
  • Submit assignment
  • Groups present patents/discuss in class

• WHK “IP Wars”
  • WHK experience in University, Government Labs, Bell Labs
  • WHK Experience as Expert Witness (5 cases+)
  • WHK Experience as Founder of Clerio Vision, Inc.
  • WHK >50 US Patents (>153 International Patents wipo.int)
  • Pre-employment agreements, IP agreements, UR IP Agreement, etc.
ABET Topics (also for thesis students)

- Professional Ethics in Optical Engineering and Science
  - Lecture
  - In-class exercise – role playing
  - In-class 5-minute essay

- Commitment to Lifelong Learning
  - Lecture
  - In-class exercises/discussion
  - In-class 5-minute essay

- Commitment to Sustainable Optical Engineering
  - Lecture
  - In-class exercise – role playing
  - In-class 5-minute essay
Spring semester Senior Design

- Execute the plan
- Report to the class every two weeks
- Meet with customers every two weeks
- Drafting Design Description Document
  - 1st, 2nd, 3rd revisions
- Rehearse “Elevator Pitch” 90 seconds
  - Shotgun session at Spring IA Meeting
- Final customer presentation
- Submit final DDD
- Present posters at Hajim School Design Day
- Deliver prototypes/reports (deliverables) to customers
- WHK Customer survey
Spring Semester Senior Thesis

• Do your research as specified in your thesis proposal
• Midterm review
• Final presentation and thesis writeup
OPT310/320 are Writing/Speaking Courses!

- Drafting, revising finalizing Product Requirement and Design Description Documents
- In class formal Design Reviews
- Practice 90 second Elevator Pitches (Spring IA mtg)
Hajim School Design Day

- All Hajim School Departments present the results of their Senior Design (and Senior Thesis) work
Is your Company Interested in being a Senior Design Customer?

• Let me know by August, 2018
• How about this? Hire an Optics Junior intern for summer 2017, and then we can assign the student to your design team for the academic year 😊
• Let’s talk!