

# OPTI 439A/539A: From Photonics Innovation to the Marketplace

## Professor:

Professor Robert A. Norwood, Wyant College of Optical Sciences, Room 533, Lab 506  
520-626-0936; [rnorwood@optics.arizona.edu](mailto:rnorwood@optics.arizona.edu)

**Lectures:** Tuesday and Thursday, 9:30-10:45 in Meinel 305

**Office Hours:** By appointment

**Teaching Assistant:** Matthew Malaker, [mmalaker@arizona.edu](mailto:mmalaker@arizona.edu)

**Course Description:** This course covers the process of technology development in optics and photonics intensive industries, both from the perspective of formal processes and case studies. Key aspects of the commercialization process including intellectual property, new product development processes, technical marketing and team building are treated in an interactive program informed by the instructor's 18 years of industry experience in both large corporate R&D organizations and entrepreneurial startups. Current events play a critical role in the course as we discuss breaking news in technology and business. Recent business literature is incorporated and discussed.

**Undergraduate Course Requisites:** Engineering Advanced Standing, Completion of OPTI 380A and OPTI 380B or equivalent level courses.

## Course Objectives and Learning Outcomes:

- Provide practical, working knowledge of all aspects of intellectual property, including patents, trademarks and trade secrets. Students will learn how to draft invention disclosures and patent claims.
- Comprehensively treat technology commercialization processes such as stage-gate systems, with an emphasis on systems that have proven successful in technology driven industries. Students will work in groups to develop stage-gate presentations.
- The fundamentals of technical marketing will be stressed and students will be capable of composing company profiles for both customers and competitors.
- A strong understanding of team dynamics and how successful teams are built will be acquired.
- The key course concepts will be applied to several intriguing case studies from the photonics industry, as well as other high technology industries.

## Required Text

None. Readings will be provided from a variety of sources. Access to all course materials will be provided through D2L.

## Grading (OPTI 439A)

- Invention disclosure project - 10%

- Midterm exam – 25%
- Group Gate 1 presentation – 20%
- Company profiles project – 15%
- Final exam – 30%

The grade will be determined according to the cumulative percentage earned such that 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, below 60% = E.

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Graduate students will be expected to complete an executive summary of their business plan/invention disclosure project that is a portion of the Group Gate 1 presentation grade.

### **Course Outline**

#### **Module 1: Introduction**

- Technology ≠ Science & Engineering
- Essentials of Innovation
- Marketplace and Marketing

#### **Module 2: Case Study I: Uniphase – Growth by Technology Acquisition**

- From Sleepy Laser Company to Market Leader
- The Visionary
- The Technologist
- An Explosive Market

#### **Module 3: Protecting Innovation**

- What is an Invention?
- Patent Basics
- Drafting a Disclosure
- The Value of Trade Secrets

#### **Module 4: New Product Development Overview**

- Marketplace Warfare
- Learning from Failure
- The Actual New Product Process
- Keys to New Product Victory
- Execution is Essential

#### **Module 5: New Product Process**

- Stage-gate Systems

- Managing Risk
- Ideas and Better Ideas – Structured Brainstorming
- Building a Business Case
- Economic Models
- Gate Reviews
- The Value Proposition
- Business Model Canvas

**Module 6:** Case Study 2: Ciena – Capturing the Value

- Right Technology, Wrong Market
- A Key Component
- A Desperate Industry
- Execution and Payoff

**Module 7:** Technical Marketing and Sales

- Marketing 101
- Markets, Segments and Niches
- Crafting the Value Proposition – the Customer as the Resource
- The Innovator’s Dilemma – Disruptive Innovation
- Innovation X

**Module 8:** Building the Team

- The Importance of Preferences
- Complementary Skills – Seeing the Blind Spots
- The Soft Stuff
- Situational Leadership

**Module 9:** Smarter, Faster, Better

- Motivation
- Teams
- Focus
- Decision Making

**Module 10:** Technology Transfer

- MIT Case Study
- UA Photonics Technology Transfer Examples

**Module 11:** Case Study 3: NorCon Technologies – University Startup in Real Time

**Academic Integrity** (<http://web.arizona.edu/~studpubs/policies/cacaint.htm>)

According to the Arizona Code of Academic Integrity “Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student’s submitted work must be the student’s own.” Unless otherwise noted by the instructor, work for all assignments in this course must be conducted independently by each student. Co-

authored work of any kind is unacceptable. Misappropriation of exams before or after they are given will be considered academics misconduct.

Misconduct of any kind will be prosecuted and may result in any or all of the following:

- Reduction of grade
- Failing grade
- Referral to the Dean of Students for consideration of additional penalty, i.e. notation on a student's transcript re. academic integrity violation, etc.

### **Attendance Policy**

It is important to attend all classes, as what is discussed in class is pertinent to adequate performance on assignments and exams. If you must be absent, it is your responsibility to obtain and review the information you missed. This is especially important in this course where a substantial amount of course material will emerge through class discussion.

"All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored."

### **Classroom Behavior**

The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. See: <http://policy.web.arizona.edu/threatening-behavior-students>.

### **Accessibility and Accommodations**

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu>) to establish reasonable accommodations.

*The information contained in this syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.*