

Department of Electrical and Computer Engineering  
Request for ECE 398

The information requested here is to be furnished for each ECE 398, ECE 498, and ECE 598 course listing. **A given course should not be offered under these numbers for a second time unless a request for a permanent number accompanies the second request.** Prior approval by the appropriate committees and the department head is required each semester the course is offered.

**Course Title:** Introduction to Photonics

**Catalog Description:** First course on active and passive photonic devices and applications. An introduction to optical processes in dielectric and semiconductor materials will be presented including waveguide confinement, electrical junctions, and electro-optics. Active and passive photonic components such as light emitting diodes, lasers, photodetectors, liquid crystals, and optical fiber will be introduced as well as optical communication and display applications.

**Prerequisites:** Credit in Phys 214.

**Instructor(s):** Kent Choquette

**How many times has this course been offered?** Has never been offered .

Proposed for: Fall X Spring \_\_\_\_\_  
Year \_\_\_\_\_ Year 2010

Course No: ECE 398KC \_\_\_\_\_ ECE 498 \_\_\_\_\_ ECE 598 \_\_\_\_\_  
Credit: 3 undergraduate hours \_\_\_\_\_ graduate hours

Normally credit of 1 hour results from 3 hours of lab or 1 hour of lecture-discussion per week for ECE 498 level courses.

**Please indicate:** Lect X Disc \_\_\_\_\_ Lab \_\_\_\_\_.

Time of Day: 10:00 AM Days of week: MWF

Labs: \_\_\_\_\_ Maximum enrollment 30 ITS Room **YES**  
(please circle)

**Course Justification:**

- a. **Please attach the course syllabus.**
- b. Justify the course in terms of new subject matter and how the addition of this course relates to the overall pattern of the courses in your unit.
- c. Explain how the course is different from similar offerings in other units.

Request prepared by: Kent Choquette Date: Jan. 20, 2010 .

**Recommendations:**

Area Committee \_\_\_\_\_ Date \_\_\_\_\_.

Curriculum Committee \_\_\_\_\_ Date \_\_\_\_\_.

Graduate Committee \_\_\_\_\_ Date \_\_\_\_\_.

## ECE398KC Introduction to Photonics

Proposed text: Class notes

Supplementary texts: Saleh and Teich, *Fundamentals of Photonics*, 2<sup>nd</sup> Ed. (Wiley 2009)

R. Quimby, *Photonics and Lasers; An Introduction* (Wiley 2006)

R. Pierret, *Semiconductor Device Fundamentals* (Addison Wesley 1996)

**Description:** First course on active and passive photonic devices and applications. An introduction to optical processes in dielectric and semiconductor materials will be presented including waveguide propagation, confinement, electrical junctions, and emission/absorption. Active and passive photonic components such as light emitting diodes, lasers, photodetectors, liquid crystals, and optical fiber will be introduced as well as optical communication and display system applications.

**Justification:** To provide a technical context for modern photonic devices and applications for all undergraduate students in electrical and computer engineering. No junior level introduction course to photonics currently is offered. The cellular phone and its associated information distribution systems are used to introduce and motivate the study of photonic devices. The study and application of electromagnetic and semiconductor properties from a different perspective will provide motivation and background necessary for advanced courses.

<b>Grading:</b>	Homework	25%
	Midterm Exam I	25%
	Midterm Exam II	25%
	Final Exam	25%

### **Syllabus:**

1) Introduction	5%
Constituent devices of cellular phone & information networks	
2) Semiconductor Electronic Properties	20%
Energy bands & Carriers	
Emission & absorption	
3) Electrical Junctions	
Equilibrium depletion	
Forward/reverse bias	
Electronic confinement	
4) Active Photonic Devices	30%
Detectors & solar cells	
Light emitting diodes & lasers	
5) Dielectric Optical Properties	20%
Wave equation	
Refraction/reflection	
Attenuation & dispersion	
6) Liquid Crystal Optics	20%
Electro-optics	
Spatial light modulators	
7) Optical Communication Systems	
Optical links	
Modulation & multiplexing	
8) Two Midterm Exams (in-class)	5%