

KOÇ UNIVERSITY
ELEC 421 / ELEC 521 / PHYS 521 / OEPE 501
PHOTONICS AND LASERS
FALL 2014

Class Meeting Time and Location: Mon/Wed 11:30 – 12:45 ENG Z21A

Instructor: Şükrü Ekin Kocabaş, ENG Z21A, (212)338-1776, ekocabas@ku.edu.tr

Office Hours: Wed 15:00 – 16:00 or by appointment

Course web page: <http://courses.ku.edu.tr/elec421>

Course email list: elec421@ku.edu.tr

Number of Credits: 3

ETCS Credits: 3

Course Assistant: TBA

Course Description: Fundamentals of electromagnetism: Maxwell's equations, plane waves, reflection & transmission of plane waves, optical coatings; Waveguides: wave equation in rectangular coordinates and the analysis of dielectric slab waveguides; Geometrical optics; Gaussian beams and optical resonators; Interaction of light with matter: classical theory of absorption and dispersion, broadening processes, Rayleigh scattering, blackbody radiation, spontaneous and stimulated light emission; Lasers: optical amplification, theory of laser oscillation, examples of laser systems.

Course Objectives: This course will help you understand the working principles of various optical instruments (i.e. microscopes, cameras), how light interacts with matter and how lasers work.

Learning Outcomes: At the end of the course you will be able to read the description of an optical instrument and understand how it functions. You will be expected to demonstrate your understanding through homework assignments and examinations. Some of the homework assignments will require programming.

Grading:

Midterm Exam 1 — %25

Midterm Exam 2 — %25

Final Exam — %35

Weekly problem sets, due one week later — %15

Late homework policy: You can return one homework late (i.e. return in on a Wednesday instead of the Monday deadline). Otherwise late homeworks will not be accepted. Exceptions can be made in case of emergencies—please inform the instructor as soon as possible.

Academic Integrity: You are encouraged to talk to your classmates about homework assignments and the class in general. For instance, if there is a concept that you need to understand in order to solve a homework problem or if there is a specific technique that you do not know well (i.e. an integration method) feel free to consult your fellow classmates. However, you are expected to do the work yourselves and copying of solutions is not allowed. Make sure you properly reference the work of others as well. Unethical acts regarding the class will be referred to the relevant university committee.

Textbook:

- Kenyon, Ian R. *The Light Fantastic*, 2nd edition. Oxford University Press, 2011. (Not yet in the library.)

Reference books:

- Sennaroğlu, Alphan. *Photonics and Laser Engineering: Principles, Devices, and Applications*. New York: McGraw-Hill, 2010. (Main library call number TA1520.S46 2010)
- Siegman, A E. *Lasers*. Mill Valley, Calif: University Science Books, 1986. (TA1675.S5 1986)
- Saleh, Bahaa E. A, and Malvin C. Teich. *Fundamentals of Photonics*. New York: Wiley, 1991. (TA1520.S24 1991)
- Pollock, C R. *Fundamentals of Optoelectronics*. Chicago: Irwin, 1995. (TA1750.P64 1995)
- Verdeyen, Joseph T. *Laser Electronics*. Englewood Cliffs, N.J: Prentice-Hall, 1995. (TA1675.V47 1995)
- Yariv, Amnon, and Pochi Yeh. *Photonics: Optical Electronics in Modern Communications*. New York: Oxford University Press, 2007. (TA1520.Y37 2007)
- Milonni, Peter W, and J H. Eberly. *Lasers*. New York: Wiley, 1988. (QC688.M55 1988)

Tentative Course Schedule: This semester we will have 28 lectures. The course textbook is renewed this year, and I am providing the relevant sections for both the previous (Sennaroğlu [S]) and current (Kenyon [K]) texts.

Lecture No	Topic	Sections [S]	Sections [K]
1	Course overview, EM review	1.1–1.5	Ch 9
2	EM review	1.6–1.9	Ch 9
3	Plane waves	1.9	Ch 9
4	Reflection / Transmission of EM waves	1.10	Ch 9
5	Reflection / Transmission of EM waves	1.10	Ch 9
6	Optical coatings	1.11	Ch 9
7	Waveguides—General formalism	10.1	Ch 16
8	Slab Waveguides	10.2	Ch 16
9	Geometric optics	2.1–2.3	Ch 2
10	Midterm Exam 1		
11	Geometric optics	2.4–2.6	Ch 3
12	Geometric optics	2.7–2.8	Ch 3
13	Laser beams and resonators	3.1	Ch 6
14	Laser beams and resonators	3.1	Ch 6
15	Laser beams and resonators	3.2	Ch 5
16	Laser beams and resonators	3.3	Ch 5
17	Laser beams and resonators	3.4	Ch 5
18	Light-matter interactions	4.1	Ch 11
19	Light-matter interactions	4.1	Ch 11
20	Light-matter interactions	4.1	Ch 11
21	Light-matter interactions	4.2	Ch 11
22	Midterm Exam 2		
23	Lasers	6.1	Ch 14
24	Lasers	6.2–6.3	Ch 14
25	Lasers	6.4	Ch 14
26	Lasers	6.5	Ch 14
27	Lasers	6.5	Ch 14
28	Review		

Koç University

Statement on Academic Honesty

with Emphasis on Plagiarism

Koç University expects all its students to perform course-related activities in accordance with the rules set forth in the Student Code of Conduct (<http://vpaa.ku.edu.tr/academic/student-code-of-conduct>). Actions considered as academic dishonesty at Koç University include but are not limited to cheating, plagiarism, collusion, and impersonating. This statement's goal is to draw attention to cheating and plagiarism related actions deemed unacceptable within the context of Student Code of Conduct:

All individual assignments must be completed by the student himself/herself, and all team assignments must be completed by the members of the team, without the aid of other individuals. If a team member does not contribute to the written documents or participate in the activities of the team, his/her name should not appear on the work submitted for evaluation.

Plagiarism is defined as 'borrowing or using someone else's written statements or ideas without giving written acknowledgement to the author'. Students are encouraged to conduct research beyond the course material, but they must not use any documents prepared by current or previous students, or notes prepared by instructors at Koç University or other universities without properly citing the source. Furthermore, students are expected to adhere to the Classroom Code of Conduct (<http://vpaa.ku.edu.tr/academic/classroom-code-of-conduct>) and to refrain from all forms of unacceptable behavior during lectures. Failure to adhere to expected behavior may result in disciplinary action.

There are two kinds of plagiarism: Intentional and accidental. Intentional plagiarism (Example: Using a classmate's homework as one's own because the student does not want to spend time working on that homework) is considered intellectual theft, and there is no need to emphasize the wrongfulness of this act. Accidental plagiarism, on the other hand, may be considered as a 'more acceptable' form of plagiarism by some students, which is certainly not how it is perceived by the University administration and faculty. The student is responsible from properly citing a source if he/she is making use of another person's work. For an example on accidental plagiarism, please refer to the document titled "An Example on Accidental Plagiarism".

If you are unsure whether the action you will take would be a violation of Koç University's Student Code of Conduct, please consult with your instructor before taking that action.

An Example on Accidental Plagiarism

This example is taken from a document prepared by the City University of New York.

The following text is taken from Elaine Tyler May's *Myths and Realities of the American Family*:

“Because women's wages often continue to reflect the fiction that men earn the family wage, single mothers rarely earn enough to support themselves and their children adequately. And because work is still organized around the assumption that mothers stay home with children, even though few mothers can afford to do so, child-care facilities in the United States remain woefully inadequate.”

Below, there is an excerpt from a student's homework, who made use of May's original text:

“As Elaine Tyler May points out, “women's wages often continue to reflect the fiction that men earn the family wage” (588). Thus many single mothers cannot support themselves and their children adequately. Furthermore, since work is based on the assumption that mothers stay home with children, facilities for day care in this country are still “woefully inadequate.” (May 589)”.

You may think that there is no plagiarism here since the student is citing the original author. However, this is an instance of accidental plagiarism. Although the student cites May and uses quotation marks occasionally, the rest of the sentences, more specifically the following section: “Thus many single mothers cannot support themselves and their children adequately. Furthermore, since work is based on the assumption that mothers stay home with children, facilities for day care in this country are still “woefully inadequate.” (May 589)” almost exactly duplicates May's original language. So, in order to avoid plagiarism, the student either had to use quotation marks for the rest of the sentences as well, or he/she had to paraphrase May's ideas by using not only his/her own words, but his/her own original ideas as well. You should keep in mind that accidental plagiarism often occurs when the student does not really understand the original text but still tries to make use of it. Understanding the original text and understanding why you agree or disagree with the ideas proposed in that text is crucial both for avoiding plagiarism and for your intellectual development.

Reference(s):

Avoiding and Detecting Plagiarism: A Guide for Graduate Students and Faculty.

The Graduate Center. City University of New York, 2012. Web.

http://www.gc.cuny.edu/CUNY_GC/media/CUNY-Graduate-Center/PDF/Publications/AvoidingPlagiarism.pdf