The Hong Kong University of Science and Technology

UG Course Syllabus

Photonics and Optical Communications

ELEC 4620

4 Credits

Pre-requisites: ELEC 3600

Name: Andrew Wing On POON

Email: eeawpoon@ust.hk

Office Hours: By email appointments

Course Description

To introduce the principles of photonics and optoelectronics for applications in optical communications. Core topics include light propagation in optical waveguides, transmission characteristics of optical fibers, fundamentals of light-matter interactions, principles of lasers, semiconductor physics for photonic devices including light-emitting diodes, laser diodes and photodetectors. Laboratory sessions will give six hands-on experiences in building experimental setups to characterize optical fibers, light-emitting diodes, laser diodes, photodetectors, and wavelength-division-multiplexed optical links.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. EXPLAIN the fundamental principles and concepts of photonics in the context of optical communications,

2. UTILIZE a range of components in photonics and optical communications,

3. COMMUNICATE effectively using appropriate technical terminology and conventions in photonics and optical communications,

4. SELF-LEARN on key current developments in photonics and optical communications.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Homework	30%	dd/mm/yyyy *
Lab	24%	dd/mm/yyyy *
Project report + presentation	Report (10%), presentation (6%)	dd/mm/yyyy *
Final examination	30%	dd/mm/yyyy

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO1, ILO3	Homework evaluates students' ability to explain the fundamental principles and concepts of photonics in the context of optical communications (ILO1) and communicate effectively using appropriate technical terminology and conventions in photonics and optical communications (ILO3).
Lab	ILO1, ILO2, ILO3	This task enriches students' hands-on skills and knowledge in utilizing a range of components in photonics and optical communications (ILO2), evaluate students' ability to analyze the laboratory measurements based on the fundamental principles and concepts of photonics in the context of optical communications (ILO1) and to communicate effectively their laboratory findings in written reports using appropriate technical terminology and conventions in photonics and optical communications (ILO3).
Project report + presentation	ILO1, ILO3, ILO4	These tasks allow students to put into practice what they have learned from lectures and laboratory experiments through their self-proposed independent-study project (ILO4). It also evaluates students' ability to analyze the project findings based on the fundamental principles and concepts of photonics in the context of optical communications (ILO1) and to communicate effectively their project work in a final report and in a presentation using appropriate technical terminology and

		conventions in photonics and optical communications (ILO3).
Final examination	ILO1, ILO3	Final examination evaluates students' ability to explain the fundamental principles and concepts of photonics in the context of optical communications (ILO1) and communicate effectively using appropriate technical terminology and conventions in photonics and optical communications (ILO3).

Grading Rubrics

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

Nil

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include [specific details, e.g., strengths, areas for improvement]. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Nil

Required Texts and Materials

Nil

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Additional Resources

Reference Books/Materials:

John Senior, *Optical Fiber Communications*, latest edition

Gerd Keiser, *Optical Fiber Communications*, latest edition

Joseph C. Palais, *Fiber Optic Communications*, latest edition

(Professional magazines – optional reading)

Optica Optics & Photonics News

IEEE Spectrum