Form 2B

City University of Hong Kong

Information on a Course offered by Department of Electronic Engineering with effect from Semester A 2012/13

Part I

Course Title: Optical Fibres and Waveguides

Course Code: EE6429

Course Duration: One Semester (13 weeks)

No. of credits: 3

Level: P6

Medium of Instruction: English

Prerequisites *:* Nil

Precursors *:* Nil

Equivalent Course *:* Nil

Exclusive Courses: Nil

Part II

Course Aims:

The aim of the course is to provide students with fundamental theoretical knowledge and analytical skills necessary for an in-depth understanding of the modern optical fibre and waveguide technology, as well as an opportunity to discover new knowledge in the subject area by carrying out independent research studies on advanced topics of current interest.

Course Intended Learning Outcomes (CILOs)
Upon successful completion of this course, students should be able to:

No.	CILOs
1.	Analyze the modal and transmission characteristics of optical fibres
2.	Analyze the modal characteristics of planar waveguides and describe common waveguide fabrication and measurement techniques
3.	Analyze the characteristics of some common fibre and waveguide devices
4.	Perform independent studies on new developments and applications related to the optical fibre and waveguide technology

Teaching and Learning Activities (TLAs)
(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO 1-4	Lectures; Problem solving and discussion during tutorials; Take-home/in-class assignments; Individual research study on new developments in the subject

Timetabling Information

Pattern	**Hours**
Lecture:	26
Tutorials:	13
Laboratory:	
Other activities:	

Assessment Tasks/Activities
(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

	Type of assessment tasks	*Weighting (if applicable)*
Continuous Assessment	Test, Assignments, Essay and presentation on an individually assigned research topic	50%
Examination	Written exam	50% 2 hours

Remarks: To pass the course, students are required to achieve at least 35% in course work and 35% in the examination and complete the individual research study.

Grading of Student Achievement:
Refer to Grading of Courses in the Academic Regulations for Taught Postgraduate Degrees.

Letter Grade	**Grade Point**	**Grade Definitions**
A+ A A-	4.3 4.0 3.7	Excellent
B+ B B-	3.3 3.0 2.7	Good
C+ C C-	2.3 2.0 1.7	Adequate
D	1.0	Marginal
F	0.0	Failure

Constructive Alignment with Programme Outcomes

PILO	**How the course contribute to the specific PILO(s)**
1, 2, 3, 4	The course provides students with the fundamental theoretical knowledge and analytical skills necessary for an in-depth understanding of the modern optical fibre and waveguide technology, which underlines the advancement of optical communications, optical signal processing, and optical sensing. The students have many opportunities to formulate and solve problems within the subject area by applying the learnt knowledge and skills.
2, 5	The course provides an opportunity for each student to discover new knowledge by carrying out an independent research study on an advanced topic of current interest.

6	The students can practise their communication skills through essay writing and power-point presentation of their results on the research studies.

Part III

Keyword Syllabus:

Electromagnetic Theory of Guided Waves
Wave equations
Concept of modes

Optical Fibres
Multimode fibres
Single-mode fibres
Special fibres (birefringent fibres, photonic crystal fibres, etc.)
Transmission characteristics of fibres

Planar Optical Waveguides
Slab waveguides
WKB analysis of graded-index waveguides
Rectangular-core waveguides
Marcatili's method
Effective-index method
Fabrication and characterisation of waveguides

Coupled-Mode Theory
Coupled-mode equations
Application to parallel waveguides
Application to periodic structures

Selected Topics on Fibre and Waveguide Devices and Applications
Passive devices (couplers, WDM multiplexers, gratings, etc.)
Active devices (electro-optic modulators, optical amplifiers, etc.)
Applications (Optical amplification, dispersion compensation, fibre sensors, biosensing, etc.)

Recommended Reading:

M J Adams: An introduction to Optical Waveguides, (John Wiley, 1981)

A W Snyder and J D Love: Optical Waveguide Theory, (Chapman and Hall, 1983)

T Tamir (Ed.): Integrated Optics, (2nd Edition, Springer-Verlag, 1985)

H Nishihara, M Haruna, and T Suhara: Optical Integrated Circuits, (McGraw-Hill, 1985)

D L Lee : Electromagnetic Principles of Integrated Optics, (John Wiley, 1986)

D Marcuse: Theory of Dielectric Optical Waveguides, (2nd Edition, Academic Press, 1991)

R Syms and J Cozens: Optical Guided Waves and Devices, (McGraw-Hill, 1992)

A Ghatak and K Thyagarajan: Introduction to Fiber Optics, (Cambridge University Press, 1998)

K S Chiang: Integrated Optic Waveguides in Encyclopedia of Electrical and Electronics Engineering, J. G. Webster (Ed.) (John Wiley, 1999), Vol. 10, pp. 400-418; updated online version 2007.

Professional journals, such as Journal of Lightwave Technology, IEEE Photonics Technology Letters, Optics Letters, Optics Express, Electronics Letters, etc.

Online Resources (if any)
Nil