

# ELEC8355

THE UNIVERSITY OF  
NEW SOUTH WALES

## Optical Communication Systems

### COURSE INFORMATION



### Session 1, 2009

School of Electrical Engineering &  
Telecommunications

### Course Staff

**Coordinator:** Prof G.D. Peng  
Room EE309, Tel: 9385 4014, Email: G.Peng@unsw.edu.au

**Consultations** Students are encouraged to consult with the coordinator by email; Students may seek consultation with the course coordinator at other times by appointment. If necessary, regular consultation times could be arranged.

### Course Details

**Credits:** This is a 6 UoC postgraduate course.

**Contact hours:** This is a distance learning course and the contact will be mostly through email.

### Course Context and Aims

The course aims to make the student familiar with fundamental principles, theoretical methods and experimental technologies of optical communication systems, and enable the student to carry out basic optical fibre system analysis, design and measurement.

This course will cover topics including

- Unit 1** Introduction to Optical Communication Systems
- Unit 2** Optical Sources I: Light Emitting Diodes
- Unit 3** Optical Sources II: Lasers and Fibre Amplifiers
- Unit 4** The Optical Channel: Optical Fibres
- Unit 5** Optical Detection I: Photodiodes
- Unit 6** Optical Detection II: Receiver Noise
- Unit 7** Digital Optical Fibre Communication Systems
- Unit 8** Analogue Optical Fibre Communication Systems

- Unit 9** Components for Optical Systems
- Unit 10** Wavelength Division Multiplexing (WDM)
- Unit 11** Optical Networks
- Unit 12** Nonlinear Effects on Optical Systems

## Relation to other courses

The course is a professional elective offered to postgraduate students at the University of New South Wales. The course gives the foundations for optical communication systems.

**Pre-requisites:** There is no pre-requisites for this course. However, it would be very helpful if you have completed ELEC8350 or ELEC9350 first.

**Assumed knowledge:** It is essential that the students are familiar with the fundamentals of optical fibres, electromagnetic theory, engineering mathematic methods and communication system theory. It is further assumed that the students have satisfactorily completed undergraduate courses in electrical engineering or physics. If you feel you don't have the appropriate background, then these books should help.

B.P. Lathi, *Modern Digital & Analog Communication Systems*  
D.K. Cheng, *Field & Wave Electromagnetics*

**Following courses:** None.

## Teaching strategies

The course provides lecture notes, tutorial questions and assignments for students to study by themselves. The coordinator will provide assistance through regular communication through email and consultation. Effective learning can be achieved when you are actively engaged in the learning process and communicating and discussing freely with the course coordinator and fellow students.

**Lecture notes:** The notes provide the students with a focus on the key concepts, principles and methods in the course. Students should follow the instructions provided together with the notes.

**Tutorials:** The tutorials provide the student with problems and questions directly linked to quantitative and qualitative understanding of optical fibre materials, physical properties, modelling, analysis, design and application of optical fibre systems. The tutorials take the student through most of course topics and aim to make the students familiar with technical considerations, issues and methods in solving problems and questions in optical fibre communication systems. The students are strongly encouraged to complete all the tutorial questions by themselves or in small groups.

**Consultations:** Students are strongly encouraged to consult the course coordinator regarding any questions, problems or difficulties by email. Students may seek face-to-face consultation with the course lecturer by appointment. If necessary, regular consultation times could be arranged.

## UNSW Graduate Attributes

This course is designed to provide opportunities that foster students core UNSW graduate attributes, in particular:

1. *The ability to engage in independent and reflective learning, which is addressed by this distance learning course;*
2. *The skills in scholarly enquiry and the in-depth engagement with relevant disciplinary knowledge and technical issues through consultation with the coordinator, lecture notes, reference books and tutorial questions;*
3. *The extended capacity for analytical and critical thinking and for creative problem-solving, by emphasizing theoretical analysis methods and tutorial exercises;*
4. *The skills to locate, evaluate and use relevant information, which is required for the assignments (problems and survey report);*
5. *The skills of effective technical communication, which are addressed and assessed by the assignments (problems and survey report) and final examination.*

## Learning outcomes

At the conclusion of this course, the students should have a good understanding of

1. *Fundamental principles & techniques of optical fibre systems*
2. *Photonic components in optical communication systems*
3. *Design & application of various optical communication systems*
4. *Basic aspects of optical networks*
5. *Current topics & issues in optical communication systems*

## Assessment

Your final mark is determined by four parts:

Assignment 1	10%
Assignment 2	10%
Assignment 3	10%
Final examination:	70%

**Assignment:** The assignments includes both short-answer questions on routine calculations and fundamental facts and also a selection of longer problems. A list of formulae will be provided in your examination paper. You need remember some simple relations not included.

**Self assessment:** At the end of each unit you'll find some exercises designed to help you test your understanding of what you are reading. Where appropriate, answers to the exercises are provided so you can check your answers. Do try to complete the exercises on your own first. If you have problems, discuss them with your teacher.

**Final examination:** The exam will be standard closed-book 3 hour written examination. University approved calculators are allowed. The examination tests analytical and critical thinking and general understanding of the course material in a controlled fashion. The final examination includes both short-answer questions on routine calculations and fundamental facts and also a selection of longer problems. A list of formulae will be provided in your examination paper. You need remember some

simple relations not included. Assessment is a graded mark according to the correct fraction of the answers to the exam questions.

## Resources for Students

### Reference books

We recommend you have either of these as a main reference book:

- J. Senior (1992), *Optical Fibre Communications*, 2nd ed, Prentice-Hall
- G. Keiser (2000), *Optical Fibre Communications*, 3rd ed, McGraw-Hill

### Course materials

Course related materials and notes will be handed out at the beginning of the session. Additional materials will be distributed through Vista or email. Assignments will be made available as follows

Assignment 1:

Be available on web on	<b>Friday, Week 3,</b>
<a href="#">Deadline for submission on</a>	<b>Monday, Week 7:</b>

Assignment 2:

Be available on web on	<b>Friday, Week 6</b>
<a href="#">Deadline for submission on</a>	<b>Monday, Week 10:</b>

Assignment 3:

Be available on web on	<b>Friday, Week 9</b>
<a href="#">Deadline for submission on</a>	<b>Monday, Study Week:</b>

## Other Matters

**Academic Honesty and Plagiarism:** Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a serious offence by the University and severe penalties may apply. For more information about plagiarism, please refer to <http://www.lc.unsw.edu.au/plagiarism>

**Continual Course Improvement:** Students are advised that the course is under constant revision in order to improve the learning outcomes of its students. Please forward any feedback (positive or negative) on the course to the course lecturer or via the Course and Teaching Evaluation and Improvement Process.

**Administrative Matters:** You need to be informed on the School's and University's policies about students' responsibilities, academic & other misconduct, special consideration, conduct of examinations, and the submission & assessment of assignments as well as students' equity and diversity, occupational health and safety, enrolment and rights. Such policies can be found at [www.ee.unsw.edu.au](http://www.ee.unsw.edu.au) and [www.student.unsw.edu.au/atoz](http://www.student.unsw.edu.au/atoz), respectively.

Any student who, by reason of disability, needs modification of his/her teaching or learning environment is encouraged to contact us or the University's Equity Officer (Disability) on 9385 4734.