Course Description

4041 - Optical Communication Engineering

Course Code:	ELEC ENG 4041
Course Title	Optical Communication Engineering
Academic Year:	2009
Semester:	2
Units:	2
Lecturer:	Prof D. Abbott
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Aim
Review of optics and lightwave propagation. Introduction to communication systems. Optical waveguides. Integrated optic waveguide. Dispersion and distortion effects. Single-mode and multi-mode optical fibres. Attenuation characteristics. Practical configurations. Light sources. Light emitting diodes. Laser operation. Laser diodes. Coupling considerations. Optical amplifiers. Light detectors. Photoelectric effects. PIN photodiodes. Avalanche photodiodes. Receiver circuits. Modulation. Analogue modulation formats. Digital modulation formats. Subcarrier techniques and multiplexing. Harmonic distortion and intermodulation. Noise and detection. Thermal and shot noise effects. Signal-to-noise ratios for digital and analogue systems. Thermal-noise limited and Shot-noise limited systems. Receiver design. System design. Analogue and digital point-to-point link design. Fibre distribution networks. Optical storage concepts. Dense Wave Division Multiplexing (DWDM), Compact Disc, DVD and other optical storage.

Outcomes
Graduates of this course will understand the engineering fundamentals of photogeneration, photodetection, lightwave propagation, manipulation and storage of optical information. These fundamentals will enable graduates to investigate and solve a wide range of problems in the area of photonics.

Assumed knowledge
This course uses principles of transmission line propagation (ELEC ENG 4044 RF Engineering IV) and electronics (ELEC ENG 2008 Electronics II and ELEC ENG 3018 RF Engineering III) and communication (ELEC ENG 3015 Communications, Signals and Systems). The fundamental principles with which students should be familiar are reviewed in the early lectures within this course. Concurrent or previous enrolment in ELEC ENG 4035 Communications IV is recommended.

Delivery Methods

24 hours of lectures and tutorials

Assessment:

Quiz (1 hour): 30%
Examination (1.5 hours): 70%

COURSE OUTLINE: 4041 OPTICAL COMMUNICATION ENGINEERING

Introduction: 1 lecture

Review of Optics: 2 lectures

Lightwave Fundamentals: 3 lectures

Optical Waveguides: 4 lectures

Light Sources: 2 lectures

Optical Detectors: 1 lecture

Modulation: 1 lecture

Heterodyne Receivers: 1 lecture

Noise and Detection: 2 lectures

Fibre System Design: 2 lectures

CD, DVD and CD-ROM: 1 lecture

+ 4 tutorials

Total: 24 lectures/tutes

COURSE NOTES or TEXTBOOKS

Highly recommended course text:

J.C. Palais, Fibre Optic Communications, Publ: Prentice-Hall.

Texts for general reading:

M. Born and E. Wolf, *Principles of Optics,* Publ: Cambridge University Press

C.C. Davis, *Lasers and Electro-Optics,* Publ: Cambridge University Press

E. Rosencher and B. Vinter, *Optoelectronics*, Publ: Cambrideg University Press

B.E.A. Saleh and M.C. Teich, *Fundamentals of Photonics*, Publ: John Wiley & Sons

A. Yariv, *Optical Electronics in Modern Communications*, Publ: Oxford University Press

Graduate Attributes

GA1 An advanced level of knowledge and understanding of the theory and practice of Electrical and Electronic, Computer Systems or Telecommunications Engineering and the fundamentals of science and mathematics that underpin these disciplines.

GA2 A commitment to maintain an advanced level of knowledge throughout a lifetime of engineering practice and the skills to do so.

GA3 The ability to apply knowledge in a systematic and creative fashion to the solution of practical problems.

GA5 Interpersonal and communication skills for effective interaction with colleagues and the wider community.

GA6 An ability to work effectively both independently and cooperatively as a leader, manager or team member with multi-disciplinary or multi-cultural teams.

GA7 An ability to identify, formalise, model and analyse problems.

GA8 The capacity to design, optimise, implement, test and evaluate solutions.

GA9 An ability to plan, manage and implement solutions that balance considerations of economy, quality, timeliness and reliability as well as social, legal and environmental issues.

GA10 Personal attributes including: perseverance in the face of difficulties; initiative in identifying problems or opportunities; resourcefulness in seeking solutions; and a capacity for critical thought.

GA13 An ability to utilise a systems approach to design and operational performance.

These programs also foster the graduate attributes of the University of Adelaide and the Institution of Engineers Australia. These should be read in conjunction with the list above.

Assessment of Graduate Attributes:

Attributes GA1, GA3, GA6, GA7, GA8, GA10 and GA13 will be assesed through tutorials and the examination. The lecture material references textbook material and other reference material, providing ample opportunity for inquisitive exploration of other relevant material other than what is being taught. This will develop attribute GA1, GA2 and GA10.

da:pjs:1st February 2010