MTE 7204 Optical Communications

Course Description:

This course covers the basic material of fiber optic components, systems, and networks. It starts with the basic physics behind optical components, continuing with a discussion of optical components and their interconnection to make networks, and leading at the end to a discussion of large-scale all-optical networks that represent the future of Networking.

AIMS:

The most important outputs of the course should include understanding of:

- The physical principles of optical fibers, components, devices and networks how the components work together to create useful fiber optic networks
- How fiber optic networks are used to create large-scale communications networks and the basic economics of fiber-based networks
- How to buy optical communications services and what they cost
- How all-optical networks will function, and their advantages and problems

Detailed Course Content:

Optical Fibre: The Nature of Light , Transmitting Light on a Fibre , Light Propagation in Multimode and Single-Mode fibres, Plastic Optical Fibre (POF), Hard Polymer (plastic) Clad (silica) Fibre (HPCF)

Optical Sources: Light Emitting Diodes (LEDs), Lasers.

Optical Detectors: Photoconductors; Photodiodes including Schottky-Barrier and Avalanche Photodiodes (APDs); Hetero-Interface Photo detectors, Travelling-Wave, Resonant-Cavity, Phototransistors.

Optical Devices: Optical Component Technologies, Optical Amplifiers, Second Harmonic Generation (SHG), Splitters and, Polarization Control, Lenses and Diffraction, Filters, Modulators and Switches, Repeaters

Fibre Manufacture, Cables & Connectors: The Technology of Fiber, Fibre Cables, splicing.

Point-to-Point Transmission Systems: Modulation, System Engineering, & Control of Dispersion

Optical Link Connections in Electronic Networks: Fibre Distributed Data Interface (FDDI),Ethernet (IEEE 802.3) , Fibre Channel, Synchronous Optical Network (SONET) and SDH, Asynchronous Transfer Mode (ATM); WDM (Systems, Standards)

Optical Network Operations: connectors and multiplexors; Measuring instruments and techniques: power meter, optical spectrum analyzer, OTDR, BER meter; Link Budget and loses: Measuring optical fiber cable loses; optical network simulation packages (PTDS); safe working practices.

Teaching and Learning Pattern

The teaching of students will be conducted through lectures, tutorials, short classroom exercises, case studies, group discussions among the students and projects aimed at solving real life problems. The lecture material will be availed to the students in advance to enable them have prior reading. Solving real life problems in each theme or a number of topics will enhance the students' understanding of the problem based learning techniques.

Assessment method

Assessment will be done through coursework which will include assignments, class room and take home tests, project work and presentations and a written examination. Course work will carry a total of 40% and written examination carries 60%. Coursework marks will be divided into; Assignments 5%, Tests 10% and Practical/project Work 25%.

References:

[1] Govind P. Agrawal, "Fiber-Optic Communication Systems", 3rd Edition, Wiley, ISBN: 0-471-21571-6

[2] Eugene Hecht, "Optics", 4th Edition, Addison-Wesley, ISBN: 0-8053-8566-5

[3] Djafar K. Mynbaev and Lowell L. Scheiner, "Fiber-Optic Communications Technology",Prentice-Hall, ISBN: 0-13-962069-9

[4] Joseph C. Palais, "Fiber Optic Commmunications", 4th Edition, Prentice Hall, ISBN: 0-13-895442-9.

[5] Kaminow, Li & Willner Optical Fiber Telecommunications V B, 5th Edition: *Systems and Networks* 2008

[6] DeCusatis Fiber Optic Data Communication: *Technology Advances and Futures* 2002