The University Of Sheffield.

Electronic & Electrical Engineering.

EEE6420 SATELLITE AND OPTICAL COMMUNICATION SYSTEMS

Credits: 10

Course Description including Aims

To understand the fundamental principles underlying the basic design of satellite and optical fibre communication systems.

Outline Syllabus

The Hartley Shannon Law. Free space communications. Noise in systems. Satellite orbits. Satellite communications. Propagation over flat and curved Earth. Diffraction and scattering. Propagation through the atmosphere. Propagation into and within buildings. Introduction to optical fibre communications. Semiconductor lasers; gain and feedback. Optical fibres; structure, fabrication, ray and wave optics, attenuation and dispersion. Multimode fibres; NA, multimode dispersion. Graded index fibres; single mode fibres; mode structure, modal dispersion, cut-off. Detectors; pin diodes, response time, long λ structures. APDs; impact ionisation, noise and breakdown. System design, power budget. Dispersion limits to BL product. Network architecture (Bus and Star Networks). Wavelength Division Multiplexing. Systems and Components for DWDM.

Time Allocation

24 hours of lectures and 12 hours of other support material.

Recommended Previous Courses

Communications knowledge to the level of EEE317 “Principles of Communications”. Basic appreciation of semiconductor device physics an advantage but not essential.

Assessment

A 2 hour examination, students must answer 3 out of 4 questions.

Recommended Books

Benoit, H.	*Satellite Television*	Arnold
Gomez, J.M.	*Satellite Broadcast Systems Engineering*	Artech House
Livingston, D.C.	*The Physics of Microwave propagation*	Prentice Hall
Doble, J.	*Intro. to Radio Propagation for Fixed and Mobile Comms.*	Artech House
Pritchard, W.L. & Sciulli, J.A.	*Satellite Communication Systems Engineering*	Prentice Hall
Pratt, T. & Bostian, C.W.	*Satellite Communications*	Wiley
Wood, J.	*Satellite Communications*	Newnes
Senior, J.M.	*Optical Fibre Communications*	Prentice Hall
Battacharya, P.	*Semiconductor Optoelectronic Devices*	Prentice Hall

Objectives

By the end of the module a successful student will be able to

1. Understand the fundamental principles underlying the basic design of satellite and optical fibre communication systems.
2. Understand the trade-offs in real systems between signal to noise ratio, bandwidth and rate of information handling and their relationship to modulation schemes.
3. Display a basic knowledge of the system organisation and architecture for various types of communication systems.
4. Show appreciation of the performance and application of typical current systems.
5. Understand the principles of semiconductor lasers, detectors and optical fibres and apply this knowledge to the design of a lightwave system.
6. Appreciate the dependence of device performance on design.
7. Understand how device design and performance feed through into system performance.
8. Calculate the limits to bandwidth distance product in a fibre-optic system and recognize methods to improve system operation.
9. Calculate the light collection and data transmission properties of a fibre-optic system.