

## **CMM 371.3 Electromagnetic Propagation and Antennas (3-1-2)**

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### **Course Objectives :**

To provide the fundamental knowledge of antennas, propagation and introduction to optical fibre communications.

### **Course Contents :**

- 1. Introduction (9 hrs)**  
Review of electromagnetic waves and equations, Alternating current element for retarded vector potential, Relationship between a current element and an electric dipole, Power radiated by a current element, Input impedance of short and longer antennas, Electromagnetic field close to an antenna : Quadrature and in phase terms, Antenna theorems.
- 2. Antenna Fundamentals (11 hrs)**  
Antenna gain, effective area, and terminal impedance, Directional properties of dipole antennas, Radiation pattern for travelling wave antenna, Two-element array, horizontal patterns for broadcast arrays, Multiplication of patterns, Patterns in other planes, Yagi-Udi type dipole arrays, log-Periodic array, Aprature antenna : Parabolic dish antenna, Horn antenna and Mattress antenna.
- 3. Antennas Propagation (10 hrs)**  
Transmission loss between antennas, Transmission loss as a function of frequency, Antenna temperature and signal to noise ratio. Plane earth propagation : Ground reflection, Reflection factor and ground wave attenuation factor, Different propagation regions and Fresnel diffraction at a knife edge.

**4. Propagation in the Radio Frequency (10 hrs)**

Reflection from ionospheric layers, Reflection at medium and high frequencies. Experimental determination of critical frequencies and virtual heights, ionograms, Maximum usable and optimal frequency, lowest useful high frequency, Irregular variation of the ionosphere, Tropospheric waves : Formula for VHF propagation, tropospheric scattering, Microwave propagation : Atmospheric bending and refractivity chart.

**5. Introduction to Optical Fibres (5 hrs)**

Basis of light propagation, snell's law, total internal reflection, Acceptable angle and numerical aperture, Number of modes in a fibre, Light sources and detectors.

**Reference Books :**

1. John D. Krauss, *Antennas*, Tata McGraw Hill Book Company Ltd.
2. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating System*, 2nd Edition, Prentice Hall, Englewood Cliffs, New Jersey, 1997.
3. R.E. Collin, *Antennas and Radio Wave Propagation*, McGraw-Hill Book Company, 1985.
4. Gerd Keiser, *Optical Fibre Communications*, McGraw Hill Book Company, 1997.