



**DEPARTMENT OF ELECTRONICS**  
**MSc Electronics**  
**ELS 505 - MICROWAVE ENGINEERING**

**Unit I****10 Hours**

Microwave devices: Klystron, Velocity Modulation, Bunching process reflex Klystron efficiency, magnetron and traveling wave tubes: Principle of operation of Magnetron, Microwave characteristics, Helix TWT's, amplification process, microwave transistor, MESFETs, Transferred Electron Devices, Gunn effect, principle of operations, mode of operation, IMPATT, TRAPATT diodes.

**Unit II****10 Hours**

RADAR: Introduction, Radar block diagram and operation, RADAR equation, factor affecting range of RADAR, maximum unambiguous range, Pulse RADAR System, RADAR display, scanning and tracking with radar, Doppler effect, CW Doppler radar, MTI, Frequency Modulated CW RADAR and RADAR antennas.

**Unit III****10 Hours**

**Satellite Communication:** Introduction, Kepler's law, Orbits geostationary orbits, powersystems, attitude Control, TT&C. Transponders, antenna subsystems, station keeping, uplink and downlink budget calculations.

**Text Books:**

1. S Y Liao: Microwave devices and circuits, PHI 1980
2. M I Skolik: Introduction to radar system, 2/c McGraw Hill, 1990
3. A K Sen and A B Bhattacharya, Radar Systems and radio aids to navigation 2/c Khanna Publications, New Delhi 1992.
4. Roddy and Coolen: Electronic Communications, 4/c, PHI, 1995.
5. B C Agrawal: satellite Communication, Khanna Publications
6. A S Tabebbaym: Computer Network, 3/c, PHI, 1999
7. M Kulakarni: Microwave and radar engineering, Umesh publications.