

4/4 B.Tech - SEVENTH SEMESTER

EC 7T5B

Micro strip Antennas

Credits: 4

Lecture : 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Course Objectives:

- Provide general knowledge of the fundamental principles related with Microstrip transmission lines.
- Provide concepts of micro strip radiators.
- Analysis, design and applications of different types of Microstrip antennas.
- Understand different antenna feeding techniques for real time implementation

Learning Outcomes:

- Understanding the mathematical foundation of microstrip antenna theory, design and associated analysis.
- Analysis, design and applications of different microstrip antenna types.
- Understanding of microstrip antenna applications in communications field.

UNIT-I

Micro strip Transmission Lines-I: Micro strip transmission line. Micro strip Capacitance Evaluation: Conformal Transformation Method, Finite Difference Method, Method of sub-areas.

UNIT-II

Micro strip Transmission Lines- II: The Characteristic Impedance- Analysis, Synthesis, Micro strip line in free space, the effective relative Permittivity. Practical Microstrip Lines- Finite strip thickness, Losses.

UNIT-III

Micro strip Radiators-I: Definition, Advantages and Disadvantages, Applications of Micro strip Antenna, Radiation Mechanism of Microstrip antenna. Radiation Fields- Vector Potentials and Radiation field formulation, Micro strip antenna characteristics, calculations.

UNIT-IV

Micro strip Radiators-II: Various Microstrip antenna configurations- Micro strip Patch antenna, Printed Slot antenna, Printed Dipole antenna, Micro strip Travelling wave antenna. Surface Wave Phenomena.

UNIT-V

Rectangular Micro strip Antennas: Transmission Line Model- Fringing effects, effective length, resonant frequency, Effective width, Design. Cavity Model- Field Configurations, Equivalent Current Density, Quality factor, Bandwidth, Efficiency, Input Impedance.

UNIT-VI

Circular Patch Antennas: Electric and Magnetic fields, Resonant Frequencies, Design, Equivalent Current densities and Fields Radiated, Conductance and Directivity, Resonant Input Resistance.

UNIT-VII

Micro strip Slot antennas: Introduction, Micro strip Fed Rectangular Slot Antenna, CPW-Fed Slot Antennas, Annular Slot Antennas, Tapered Slot Antenna, Comparison of Slot Antennas with Micro strip Antenna.

UNIT-VIII

Micro strip Antenna Feeds: Introduction, Coupling to Micro strip Patches- Co-planar Coupling to a single patch, Series array to Co-planar coupling, probe coupling, Aperture Coupling, Electromagnetic Coupling. Parallel and Series Feed Systems- Parallel feeds for one and two dimensions, series feed for one dimension.

Learning Resources

Text Books:

1. Antenna Theory –Constantine A. Balanis, John Wiley& Sons, 2nd Edition, 2001.
2. Micro strip Antenna Design Hand Book – Ramesh Garg, Prakash Bhartia, Inder Bahl, Apisak Ittipiboon, Artech House, 2nd edition, 2001

References:

1. Hand book of Microstrip Antennas, J.R. James and P.S.Hall, Peter Peregrinus Ltd., London, 1st edition.,1989
2. Microwave Engineering using Microstrip Circuits- E.H.Fooks, .Zakarevicius, Prentice Hall, 1st edition, 1990.