

Microwave Integrated Circuits

B.E. Sem. VIII [EXTC]

(Elective – II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

- **Objective:** To understand the integration of microwave devices in the form of IC.

1. Hybrid MICs

Definition, characteristics, comparison with conventional circuits, fields of application and limitations and criteria for the choice of substrate material; thin film hybrid circuits, thick film hybrid circuits, artwork, mask making, photolithography, resistor stabilization, sawing, brazing process, wire bonding.

2. Monolithic MICs

Definition, substrate structure, doping by ion implantation ohmic contact, metal resistive layers, gate metal, dielectric second level metal, dielectric and air bridge vias, substrate vias, final wafer process steps.

3. Micro strip Lines

Planar wave guides, non- TEM propagation, line impedance definitions, quasi-static approximations, quasi-static line parameters, micro strip open circuits and gaps, micro strip corners, step changes in width, dispersion analysis, micro strip characteristic impedance, symmetric T junction, full wave analysis of micro strip propagation, LSE and LSM potentials, spectral domain analysis, dispersion relation for open micro strip, spectral domain impedance analysis, dispersion relation for open micro strip, spectral domain impedance analysis, Green's functions, millimeter wave modeling of micro strip lines.

4. Coupled Line Propagation

Wave equations for coupled lines, propagation models, coupled line parameters, coupled line parameter variations with frequency, directional couplings, Lange coupler coupled line pair treated as a four port, coupled line pair operated as a two port assuming $O_e = 0$, low pass filter design assuming $O_e = 0$, coupled line pair analysed to a two port O_e not equal to 0 , narrow band filter using coupled resonator, narrow band coupled line filters, suspended substrate strip lined filters, suspended substrate strip line filter design using method 1 and method 2.

5. Slot Lines

Analysis, design consideration, transitions and applications.

Coplanar Waveguide

Analysis, design considerations and coplanar line circuits.

Devices

GaAs FET, HEMT, gunn diode, varactor diodes, PIN diodes YIC resonators, dielectric resonators & their application in oscillator mixer and amplifiers.

Reference Books:

1. Microstrip Circuit Analysis (*David H. Schrader*) Prentice Hall PTR, New Jersey
2. Microstrip lines and Slot lines (*KC. Gupta, R. Garg and I.J. Bahl*) Artech House.
3. MIIC Design: GaAs FETs and HEMTs (*Peter Ladbrooke*) Artech House.
4. Foundations for Microstrip Circuit Design (*T.C. Edwards*) John Wiley and Sons
5. MIC and MMIC Amplifier and Oscillator Circuit Design (*Allen Sweet*) Artech House.
6. Handbook of Microwave Integrated Circuits (*Reinmut K Hoffman*) Artech House.

