

EEE 515 Solid State Electronics

Physics and property of semi – conductors including high field effects, carrier injection and semi conductors surface phenomena, devices technology, bulk and epitaxial material growth and impurity control, metal- semi – conductor interface properties, stability and methods of characterization: controlled and surface controlled devices. Design of silicon integrated circuits: Pattern generation, mask – alignment tolerances minimum layout spacing, the minimum – area transistor, layout of silicon integrated circuits, computer aids. Conduction in metal film, substrates, and fabrication sequences for thin circuits. Film processes, conductive, resistive and dielectric inks, thick film resistors and capacitors layout design. Chip bending, wire bonding, beam leads, tape-carrier packaging, inverted chips. Thermal considerations and packages.

Four-point probe measurement of resistivity carrier mobility, interference techniques, junction depth and impurity profile measurements, functional testing of integrated circuits. Operational amplifier

parameters, bipolar difference amplifiers, circuit imbalances, FET difference amplifiers, frequency response, current sources, improving the CMR, single ended amplifiers, level shifting, current mirrors, superbeta gain stage, output stages, voltage references, d.c. Response of operational amplifiers. Macro models. Characterization of logic circuits Eber-moll and Gummel-poon transistor models, Emitter-coupled logic, transistor-transistor logic, integrated injection logic, MOS logic circuits, EEL and Threshold logic, Film flops, MSI circuits, memories, PLA's microprocessors. Failure Rate, Reliability, and yield of integrated circuits. Failure rate and mechanisms, early failures, reliability screening procedures, useful life region, accelerated-stress life testing. Yields, defect density, poi defects, yield of multistep process, yield models.