**Knowledge Network of**
**Indian Institute of Technology Gandhinagar**
**Under TEQIP-II Initiative**

# Summer School on

# Semiconductor electronic devices

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The summer course on Semiconductor Electronic Devices comprises approximately 40 hrs of instruction and 30 hrs of hands on experience on problem solving and lab experiments. The course will first provide a sound basic understanding of the principles of semiconductor pn-junction devices and MOSFETs. Thefocus will be on the physics of semiconductor devices. Thecourse will then deal with the operational aspects that an electronics engineer would be interested to know. The course will focus on the pn junction diodes and transistors and field effect transistors and their applications as amplifiers, switches, emitters and detectors of electromagnetic waves and their use in the field of electronics, communications and remote sensing. The device-level aspects that dictate device-level performance and system-level performance will be highlighted.

This summer school provides an opportunity for the faculty members and students to revisit the important fundamental concepts. Participation in this summer school is invited through registration.

**Topics to be covered**
Semiconductor fundamentals; Crystal structure, Origin of the band gap, direct and indirect bandgap semiconductors, intrinsic and extrinsic semiconductors; Carrier statistics and carrier concentration;Motion of charge carriers in electric and magnetic fields; Drift and diffusion of charge carriers, the continuity equation; pn junctions - barrier formation; junctions under forward and reverse bias; Zener and avalanche breakdown; junction capacitance; BJTs and FETs; Optoelectronic devices – fundamentals of light-emitting diodes, semiconductor lasers and photodiodes; dc and ac operational; generation and detection of short pulses for communications and sensing applications.

**The following format will be followed in the summer school: The day comprises of** 4 hrs-Instructions +1.5 hrs of problem solving session +1.5 hrs of lab simulation.

Presenters: Instructors:

1. Prof. Arup Lal Chakraborty (IIT Gandhinagar)
2. Prof. Ragavan K

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