INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
PROFORMA FOR NEW COURSE

1.	Title of the Course	Solid State Devices
2.	Course Number	EE2204
3.	Status of the Course	Core
4.	Structure of Credits	3-0-2-4
5.	Offered To	UG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Electrical Engineering
8.	To take effect from	July 2018
9.	Prerequisite	Nil
10.	Whether approved by the Department	Yes
11.	**Course Objective:** To introduce the electronic properties of semiconductors and semiconductor devices. The laboratory component complements the theoretical concepts, emphasising various semiconductor material and device characterisation techniques.	
12.	**Course Content:** History and the relevance of solid state devices in modern world; Solids, crystals and electronic grade materials; Formation of energy bands in solids; Concept of hole; Density of states and Fermi level; Intrinsic and extrinsic semiconductors; Equilibrium carrier concentration; Direct and indirect bandgap semiconductors; Recombination and generation of carriers; Carrier transport: drift and diffusion, Equations of state: Continuity and Poisson equation; pn junction: energy band diagram, derivation of dc and ac characteristics; Bipolar junction transistors: physics and characteristics; MOS capacitor, MOSFET: physics, characteristics and modelling; Other devices: LEDs, solar cells, metal-semiconductor junctions, solid state memories. The following is the list of experiments to be conducted in the laboratory component of the course: 1. Extraction of bandgap of semiconductor from ni vs T characteristics. 2. Two-probe/Four-probe measurement of resistivity. 3. Hot-probe setup for identifying the type of conductivity. 4. Minority Carrier lifetime estimation for p-n junctions. 5. Fabrication of organic LEDs. 6. Interface state density extraction from C-V characteristics of MOS capacitors. 7. Introduction to Maskless Photolithography.	
13.	Text book(s): 1. Pierret R, *Semiconductor Device Fundamentals,* Pearson Education (2006). 2. Streetman B G and Banerjee S K, *Solid State Electronic Devices,* Prentice Hall India (2014).	
14.	Reference(s): 1. Dimitrijev S, *Principles of Semiconductor Devices,* Oxford University Press (2012). 2. Neamen D A, *Semiconductor Physics and Devices,* McGraw Hill (2012). 3. Sah C T, *Fundamentals of Solid State Electronics,* World Scientific (1991). 4. Tyagi M S, *Introduction to Semiconductor Materials and Devices,* John Wiley (2004).	