भारतीय प्रौद्योगिकी संस्थान तिरुपति
TIRUPATI

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Tirupati District, Andhra Pradesh - 517 619

1.	Title of the course	Chemical Processes in Semiconductor Fabrication
2.	Course number	CH529L
3.	Structure of credits (L-T-P-C)	3-0-0-3
4.	New course/modification to	New
5.	To be offered by	Chemical Engineering
6.	Proposed by	Sasidhar Gumma
7.	Prerequisite	CoT
8.	**Course Objective(s):** To introduce various unit operations and technologies in semiconductor device fabrication. To develop theoretical framework and mathematical models for chemical processes involved.	
9.	**Course Content:** Introduction: semiconductor materials and devices, overview of unit processes in fabrication, clean rooms; Material properties: crystal structure, dislocations and defects, phase diagrams and solubility; Crystal growth: raw material purification, melt, solution and zone growth techniques, doping, mathematical models, characterization, wafer preparation, cleaning and shaping; Diffusion: Fick's laws, analytical solutions, intrinsic diffusion coefficients, design and evaluation of diffused layers, macroscopic diffusion, point defects; Thermal oxidation: Deal-Grove and mixed ambient models for oxidation, manufacturing processes, characterization, models for growth kinetics, dependence on pressure, crystal orientation, and dopants; Thin film deposition: chemical vapor deposition (CVD), role of chemical equilibrium, rate limiting steps, atomic layer deposition (ALD), introduction to physical vapor deposition and lithography.	
10.	**Textbook(s):** 1. Campbell S A, Fabrication Engineering at the Micro- and Nanoscale, 4th Edition, Oxford University Press (2012). 2. Swaminathan P, Semiconductor Materials, Devices and Fabrication, Wiley (2019).	
11.	**Reference(s):** 1. Plummer J D, Deal M D and Griffin P B, Silicon VLSI Technology: Fundamentals, Practice, and Modeling, Prentice Hall (2000). 2. Sze S M, VLSI Technology, 2nd Edition, McGraw Hill Education (2017). 3. May G S and Sze S M, Fundamentals of Semiconductor Fabrication, John Wiley and Sons (2007). 4. Ghandhi S K, VLSI Fabrication Principles: Silicon and Gallium Arsenide, 2nd Edition, Wiley- Blackwell (1994).	