INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM
INTRODUCTION OF NEW COURSE

Course Title	**Advanced Semiconductor Devices**	Course Code	EC6XXX			
Dept./ Specialization	ECE	Structure (LTPC)	3	1	0	4
To be offered for	PG / PhD	Status	Core ☐		Elective ▬	
Faculty Proposing the course	Dr Tajendra Dixit	Type	New ▬		Modification ☐	
Recommendation from the DAC		Date of DAC	23/6/2021			
External Expert(s)	**Prof. Shreepad Karmalkar, EE Depertment, IIT Madras**					
Pre-requisite	Solid State Electronic Devices	Submitted for approval			45th Senate	
Learning Objectives	• The course is designed to teach the physical principles and operational characteristics of advanced semiconductor electronic devices with emphasis on modern field effect transistors, optoelectronics, memory devices and semiconductor sensors. • This course is designed to introduce physical insights of next generation devices for IoT and AI.					
Learning Outcomes	• Modelling and working of state of the art semicounductor devices • Ability to identify required device characteristics for a specific application • Also provide foundation on for advanced courses in nano- and quantum electronics.					
Contents of the course *(With approximate break-up of hours for L/T/P)*	● Review of Semiconductor device fundamentals and device modelling. (L3+T1 hrs) ● Noise in semiconductor devices (L4+T1) ● Tunnelling in semiconductor devices, Current transport processes in metal-semiconductor junction, transferred electron and real space transfer devices (L5+T1 hrs) ● Single electron transistor, Fin Field-Effect Transistors (FinFETs), FinFET Devices for VLSI Circuits and thin film transistors. (L8+T3) ● Advanced MOS devices (OFET, CNFET etc.) (L4+T1 hrs) ● Light Emitting devices- Light emitting diodes (III-V, Quantum, Organic LEDs) and Light Emitting Transistors, Semiconductor LASERs and applications. (L6+T3 hrs) ● Solar cells (Si, Organic, and Quantum-well solar cells), Photodetectors, Introduction to Excitonic devices. (L6+T1 hrs) ● Non-volatile memory devices, Solid state drives, Phase change memory, Memristors, Introduction to Neuromorphic devices. (L5+T1) ● Semiconductor based sensors (Gas sensors, Thermal sensors, Chemical sensors, pressure sensor) and their utilization for IoT and AI applications. (L4+T1)					
Text Book	1. S. M. Sze., K. K. Ng, "Physics of Semiconductor Devices", United Kingdom, Wiley, 2021. ISBN:9780471143239 2. Karl Hess, "Advanced Theory of Semiconductor Devices", John Wiley, 2008: ISBN: 978-0-780-33479-3 3. Bonani, Fabrizio, Ghione, Giovanni, "Noise in Semiconductor Devices", Springer, 2001. ISBN 978-3-662-04530-5 4. Colinge, J.-P., "FinFETs and Other Multi-Gate Transistors", Springer, 2008. ISBN 978-0-387-71752-4 5. Pallab Bhattacharya, "Semiconductor Optoelectronic Devices", Pearson Education, 2017. ISBN-10 : 9789332587410					
Reference Books	1. M. S. Tyagi, "Introduction to Semiconductor Materials and Devices", John Wiley, 2008: ISBN: 978-0-471-60560-7 2. Wolfgang Bruetting, Physics of Organic Semiconductors, Wiley-VCH, 2005. ISBN:9783527405503 3. S. M. Sze, "Semiconductor Sensors", Wiley-Interscience, 1994. ISBN: 978-0471546092 4. Santosh K. Kurinec, "Nanoscale Semiconductor Memories", CRC Press, 2017. ISBN: 9781351832083					