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

COURSE FORMAT

<table>
<tr><td>Course Code</td><td>(to be filled by Office of Acad.)</td><td>Course Title</td><td colspan="4">Reliability Physics of Nanotransistors</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">Electronics and Communication Engineering</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">M.Tech (MVS)</td><td>Type</td><td colspan="2">Core ☐</td><td colspan="2">Elective ▬</td></tr>
<tr><td>Status</td><td colspan="2">New ▬</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td>Fundamentals of Semiconductor Devices</td><td colspan="3">Submitted for approval</td><td colspan="2">Mention Senate Number</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To demonstrate and apply basic concepts of semiconductor physics relevant to devices
• To understand “reliability is a secret weapon” i.e., reliability of nanotransistors</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">At the end of the course, the students would be able to
• To understand when transistors are turned on and off trillions of times during the years of the operation, gradually defects accumulate within the device so that at some point the transistor does not work anymore.
• To understand the physics and mathematics regarding how and when things break</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours for L/T/P)</td><td colspan="6">Reliability of Modern Semiconductor Devices (5 L + 1 T)
Mathematics of Reliability (5 L + 1 T)
Reliability as a Threshold Problem (4 L + 1 T)
Theory and Practice of General Characterization Techniques (5 L + 2 T)
Transistor Degradation: Negative Bias Temperature Instability (5 L + 2 T)
Time-Dependent Dielectric Breakdown (5 L + 1 T)
Transistor Reliability: Hot Carrier Degradation (5 L + 2 T)
Radiation Damage in Semiconductor Devices (3 L + 1 T)
ESD Damage in Semiconductor Devices (3 L + 1 T)
Concluding Lectures (2 L)</td></tr>
<tr><td>Text Books</td><td colspan="6">1. Advanced Semiconductor Fundamentals, 2nd Edition, R. F. Pierret, Prentice Hall, ISBN No. 0-13-061792-X
2. Fundamentals of Modern VLSI Devices, Yuan Taur and Tak H. Ning, Cambridge University Press, 1998, ISBN No. 0521550564</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Semiconductor Material and Device Characterization, D.K. Schroeder, John Wiley & Sons, ISBN No. 0-471-73906-5
2. Prof. Alam’s Lecture materials from Nanohub “ https://nanohub.org/resources/16560”</td></tr>
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