**BITS PILANI – Hyderabad Campus**

**FIRST SEMESTER 2018-2019**

**Course Handout Part II**

20th Jul 2019

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

**Course no.:** MEL G631

**Course title:** Physics and Modeling of Microelectronic Devices

**Instructor-in-charge:** Dr. Sayan Kanungo

**Prerequisite:** This course assumes that the students have a prior knowledge of semiconductor physics and devices (or their equivalent) at least at the undergraduate level.

**Scope and objective of the course:**

1. Understanding the relationship between atomic structure and physical properties of semiconductors.
2. Interpreting the electronic band structure using quantum mechanics.
3. Identifying the semiconductor properties that determine the performance of electronic devices.
4. Understanding the basic physics of charge carriers in solids and carrier transport in semiconductors.
5. Understanding the underlying physics of semiconductor-semiconductor and metal-semiconductor junctions.
6. Analysis and modelling of field effect transistor devices.
7. Understanding the basics of optoelectronic devices.

**Text books:**

1. Donald A. Neamen, “Semiconductor Physics and Devices”, 3e Mc Graw Hill

**Reference books:**

1. Mark Lundstrom, “Fundamentals of Nanotransistors”, World Scientific

**Course plan:**

|  |  |  |
| --- | --- | --- |
| *No* | *Learning objectives* | *Page* |
| 1 | Introduction to Quantum Mechanics | T1: C2 |
| 2 | Quantum Theory of Solids | T1: C3 |
| 3 | Semiconductor Review | T1: C4 |
| 4 | Physics and modelling of different junctions | T1: C7, C9 |
| 5 | Analysis and modelling of the MOSFETs | R1:C3, C4, C5 |
| 6 | Analysis and modelling of short channel effects in MOSFETs | R1:C6-C8, C10-C11 |

**Evaluation scheme:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *No* | *Component* | *Duration* | *Weightage* | *Marks* | *Date & time* | *Nature* |
| 1 | Mid semester | 90 min | 20% | 40 | 05/10 – 9:00 – 10:30 am | Closed |
| 3 | Quiz | 45 min | 20% | 40 | TBD | Open |
| 4 | Laboratory | 120 min/wk | 20% | 40 | TBD | Open |
| 5 | End semester | 180 min | 40% | 80 | 13/12 FN | Closed |
|  | Total |  | 100% | 200 |  |  |

**Chamber consultation hour:** To be announced in class.

**Notices:** All notices for the course will be announced in the class and displayed only on the CMS.

**Make-up policy:** Make-up requests will be entertained ONLY for extremely serious cases where in

1. Parents of the concerned student have to request the course IC for the makeup for their ward.
2. Written & signed documentary evidence needs to be provided from the Hostel Warden confirming the reason for absence from scheduled examination.
3. In case of medical emergencies, students must produce a documentary evidence from the surgeon.

Instructor-in-charge