

## **EE6604            ADVANCED TOPICS IN SEMICONDUCTOR DEVICES**

Acad Unit:            3  
Prerequisite:        Semiconductor fundamentals  
Effective:            Acad Year 2014-2015  
Last update:        2 Oct. 2013

### **OBJECTIVE**

This course is intended for beginning graduate students and practicing R&D engineers and will cover the basic principles of operation of the bipolar junction transistor (BJT) and the metal oxide semiconductor field effect transistor (MOSFET). The applications of the MOSFET in semiconductor memory will be described. More recent developments in heterojunction devices will also be presented. In addition, some new semiconductor devices and future trends will also be introduced.

### **DESIRED OUTCOME**

- To understand in detail the fundamental principles of operation and electrical characteristics of BJTs and MOSFETs.
- To understand the principles of operation and challenges of the newer semiconductor devices and to be able to apply them to the design of different devices for different specifications.

### **OTHER RELEVANT INFORMATION**

The students intending to study this course should have taken undergraduate courses related to semiconductor fundamentals and engineering mathematics.

### **CONTENT**

Bipolar transistor operating principles. Bipolar device modeling. State-of-the-art bipolar structures. MOS device operation. MOSFET modeling. MOS device scaling effects. Semiconductor memories. Semiconductor heterojunctions and devices. New devices and future trends.

### **ASSESSMENT SCHEME**

Continuous Assessment	20%
Final Examination	80%

### **TEXTBOOK**

1. S. M. Sze and K. K. Ng, "Physics of semiconductor devices", Wiley, 2006.

## **REFERENCES**

1. Y. Taur and T. H. Ning, "Fundamentals of Modern VLSI Devices", Cambridge University Press, 2<sup>nd</sup> edition, 2011.
2. Ashok K. Sharma, "Advanced Semiconductor Memories", Wiley-Interscience, 2003.
3. J. Singh, "Physics of Semiconductors and Their Heterostructures", McGraw-Hill, 1993.