

Acad Unit: 3
Prerequisite: Nil
Effective: Acad Year 2000-2001
Last update: 15 Aug 2001

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 transistors will be presented in the final part of this course.

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

Although this course is suitable for students with diverse backgrounds, students intending to study this course should preferably have taken undergraduate courses on semiconductor devices, electromagnetism and engineering mathematics.

CONTENT

Bipolar transistor operating principles. Bipolar device modelling. State-of-the-art bipolar structures. MOS device operation. MOSFET modelling. MOS device scaling effects. Semiconductor memories. Semiconductor heterojunctions. Future trends and challenges.

ASSESSMENT SCHEME

Continuous Assessment	20%
Final Examination	80%

TEXTBOOKS

1. S.M. Sze (editor), "Modern Semiconductor Device Physics", John Wiley, 1998.
2. D.J. Roulston, "Bipolar Semiconductor Devices", McGraw-Hill, 1990.

REFERENCES

1. M.S. Shur, "Physics of Semiconductor Devices", Prentice-Hall, 1990.
2. J. Singh, "Physics of Semiconductors and Their Heterostructures", McGraw-Hill, 1993.
3. C.T. Sah, "Fundamentals of Solid State Electronics", World Scientific, 1991.