

**The ICFAI University Dehradun, Faculty of Science and Technology**

**First Semester, 2015-16**

**Course Handout**

<b>Course No</b>	<b>Course Title</b>	<b>L</b>	<b>P</b>	<b>U</b>
<b>MEL 501</b>	<b>Microelectronics Devices and Circuits</b>	<b>3</b>	<b>2</b>	<b>4</b>

**Scope and objective of the course:** The objective of this course is to develop the ability of students to analyze and design discrete and integrated electronic circuits. The course aims at providing a thorough understanding of internal electronic circuits & structures necessary for effective and reliable applications of integrated circuits. The course also includes the usage of SPICE as a circuit design aid.

Textbook(s)	Microelectronic Circuits, Adel. S. Sedra, Kenneth C Smith, Oxford University Press, Fifth Edition, 2004.
Reference book(s) R1	Microelectronic circuit Design, Richard. C. Jaeger, The McGraw-Hill Companies Inc., International Edition, 2006.
R2	CMOS circuit Design Layout and Simulation, R Jacob Baker, Harry W. Li, David, Boyce, IEEE Press series on Microelectronic Systems, PHI, 2002.

**Lecture-wise plan:**

<b>Lecture Nos.</b>	<b>Learning Objective</b>	<b>Topics to be covered</b>	<b>Reference (Chapter/Sec./Page Nos. of Text/Ref. Books)</b>
1-3	Characteristics and type of amplifiers.	Amplifiers, Circuit Models, Frequency response of amplifiers	T1
4-5	BJT Structure, I-V Characteristics, working as a switch and amplifier.	Device structure & Physical operation, I-V Characteristics, BJT as an Amplifier & switch.	T1
6	Analysis of BJT circuits under DC conditions.	BJT circuits at DC.	T1
7-9	Biasing and small signal models of BJT.	Biasing in BJT amplifier circuits, Small signal operation & Models.	T1

10-13	BJT as a single stage amplifier and its high frequency models.	Single stage BJT Amplifiers, BJT Internal capacitances & High frequency model.	T1
14-16	Structure and I-V Characteristics of MOSFET.	Device structure & Physical operation, I-V Characteristics.	T1
17-19	Working of MOSFET as amplifier, switch and its circuits at DC.	MOSFETS Circuits at DC, MOSFET as an amplifier and as a switch.	T1
20-23	Biasing and small signal models of MOSFET.	Biasing in MOS amplifier circuits, Small signal operation & Models.	T1
24-26	MOSFET as a single stage amplifier and its high frequency models.	Single stage MOS Amplifiers, MOSFET Internal capacitances & High frequency model.	T1
27-28	To Understand the concept of Differential Amplifiers.	MOS Differential pair and its analysis.	T1
29-30	Operation of MOS Differential amplifier.	Small signal operation of MOS Differential pair.	T1
31	Practical characteristics of MOS Differential pair.	Non-ideal characteristics of MOS Differential pair.	T1
32-33	Effect of active load on MOS differential amplifier.	MOS Differential amplifier with active load.	T1
34-35	To Understand the concept of Feedback	General Feedback structure, Properties of Negative feedback, Four basic feedback topologies.	T1
36-39	Analysis of Feedback amplifier.	Series-Shunt, Series-Series, Shunt-Series, and Shunt-Shunt feedback amplifier.	T1
40-41	To Understand the concept of power amplifiers and output stages	Classification of output stages. Class A, Class B and Class AB output stage.	T1
42	To learn the concepts of power transistors	Power BJT's and MOS power transistors.	T1

## **PRACTICAL/LABORATORY WORK**

Analysis of BJT and MOS Amplifier circuits using spice and other software packages.