

<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>L-T-P-C</b>	<b>YEAR OF INTRODUCTION</b>
<b>EC307</b>	<b>Power Electronics &amp; Instrumentation</b>	<b>3-0-0-3</b>	<b>2016</b>
<b>Prerequisite:</b> EC205 Electronic Circuits			
<b>Course objectives:</b> <ol style="list-style-type: none"> <li>1. To provide an insight on the concepts of Power Electronics and Electronic instruments.</li> <li>2. To study the applications of Power electronics such as Switched mode regulators and inverters.</li> <li>3. To develop understanding of the concept of Transducers and Digital instruments.</li> </ol>			
<b>Syllabus:</b> Power semiconductor switches and its static and dynamic characteristics. Switched mode regulators, SMPS, Switched mode inverters, UPS. Performance characteristics of instruments, Measurement of passive components, Different Transducers, Digital Instruments.			
<b>Expected outcome:</b> The students will be able: <ol style="list-style-type: none"> <li>1. To understand the concepts of Power Electronics and the various applications.</li> <li>2. To get an insight on various electronic instruments, their configuration and measurements using them.</li> <li>3. To understand the principle of operation of Transducers</li> </ol>			
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Bell D. A., Electronic Instrumentation and Measurements, Oxford University Press, 2003.</li> <li>2. Rashid M. H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, Third Edition, New Delhi.</li> <li>3. Umanand L., Power Electronics Essentials and Applications, Wiley India, 2015.</li> </ol>			
<b>References:</b> <ol style="list-style-type: none"> <li>1. Daniel W. Hart, Power Electronics, McGraw Hill, 2011.</li> <li>2. Doebelin E., Measurement Systems, 5/e, McGraw Hill, 2003.</li> <li>3. Helfrick A. D. and W. D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, 5/e, PHI, 2003.</li> <li>4. Mandal, Power Electronics 1e, McGraw Hill Education India, 2014</li> <li>5. Mohan N. and T. M. Undeland, Power Electronics: Converters, Applications and Design, John Wiley, 2007.</li> <li>6. Nakra, Instrumentation, Measurement and Analysis, 4e, Mc Graw –Hill Education New Delhi, 2016</li> <li>7. Patranabis D., Principles of Electronic Instrumentation, PHI, 2008.</li> </ol>			

Course Plan			
Module	Course content	Hours	End Sem. Exam Marks
I	Linear Electronics versus Power Electronics - Power semiconductor switches.	1	15
	Power diodes-structure, static and dynamic characteristics	2	
	Power transistors - Power BJT, Power MOSFET, GTO and IGBT	3	
	Steady state and switching characteristics of Power BJT, Power MOSFET and IGBT.	2	
II	Introduction to Switched mode regulators	1	15
	Buck, Boost and Buck-Boost DC-DC converters	2	
	Waveforms and expression of DC-DC converters for output voltage, voltage and current ripple under continuous conduction mode. (Derivation not required)	1	
	Isolated converters - Flyback, Forward, Push Pull, Half Bridge and Full Bridge Converters - waveforms and governing equations. (Derivation not required)	3	
FIRST INTERNAL EXAM			
III	Overview of SMPS, Switched mode inverters- Principles of PWM switching schemes.	2	15
	Single phase inverters - half bridge, full bridge and push pull.	2	
	UPS - on line and off line.	1	
	Three phase inverters - PWM and Space vector modulation in three phase inverters.	3	
IV	Generalized configurations of instruments - Functional elements. Classification of instruments	1	15
	Generalized performance characteristics of instruments - Static characteristics and Dynamic characteristics.	2	
	Measurement of: resistance using Wheastone’s bridge, inductance using Maxwell-Wien bridge, and capacitance using Schering’s bridge.	2	
SECOND INTERNAL EXAM			
V	Transducers - Classification, Selection of transducers.	1	20
	Resistance transducers - Principle of operation, strain gauge.	2	
	Inductive Transducers: LVDT.	2	
	Capacitive transducers - different types, capacitor microphone, Hall Effect transducer, proximity transducers.	2	
VI	Electronic Multimeter, Audio Power Meter, RF power meter	2	20
	Digital Instruments - Basics, digital measurement of time, phase, frequency and digital voltmeter.	2	
	Frequency synthesizer, Spectrum analyzers, Logic State analyzers (block diagram only).	1	

	Digital storage oscilloscope – Working Principle, controls and applications.	2	
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern ( End Sem Exam)

**Max. Marks: 100**

**Time: 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 100 % for theory.

