GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

INSTRUMENTATION AND CONTROL ENGINEERING

Subject Name: **Electronics in Industries**
Subject Code: **151703**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	2	5	70	30	50

Sr. No.	**Course content**
1.	**Power Semiconductor Devices:** • **Power semiconductor devices introduction** • **Power Diodes:** ▪ General Purpose Diode ▪ Fast Recovery Diode ▪ Schottky Diode ▪ Metal Oxide Semiconductor (MOS) Diode • **Power Transistor:** ▪ Power Bipolar Junction Transistor (BJT) ▪ Power Metal Oxide Semiconductor Field-effect Transistor (MOSFETs) ▪ HEXFET • **Thyristors:** ▪ Shockley Diode ▪ Thyristor ▪ Light Activated Silicon Controlled Rectifier (LASCR) ▪ Silicon Controlled Switch (SCS) ▪ Gate Turn-off Thyristor (GTO) ▪ Insulated Gate Bipolar Transistor (IGBT) ▪ Metal Oxide Controlled Thyristor (MCT) ▪ Emitter Turn-off Thyristor (ETO) • **Multilayer Devices:** ▪ Reverse Conducting Thyristor (RCT) ▪ DIAC ▪ TRIAC ▪ BENISTOR
2.	**Firing, Commutating and Protecting Circuits:** • **Thyristor Turn-on Methods:** ▪ High Voltage Turn-on ▪ High Temperature Turn-on ▪ Light Turn-on ▪ dv/dt Turn-on ▪ Gate Turn-on

	• **Devices Used for Firing Circuits:** ▪ Unijunction Transistor (UJT) ▪ Programmable Unijunction Transistor (PUT) ▪ Complementary Unijunction Transistor (CUJT) ▪ Silicon Unilateral Switch (SUS) ▪ Silicon Bilateral Switch (SBS) • **Gate Characteristic of Thyristor** • **Firing Circuits**: ▪ Diode-Resistance Firing Circuit ▪ Diode-Resistance-Capacitance Firing Circuit ▪ UJT Firing Circuit ▪ PUT Firing Circuit ▪ Synchronized UJT Firing Circuit ▪ Pulse Transformer Firing Circuit ▪ Diac Firing Circuit ▪ Silicon Bilateral Switch Firing Circuit ▪ Light Activated Firing Circuit • **Thyristor Turn-off Methods:** ▪ Line Commutation ▪ Load Commutation ▪ Forced Commutation ▪ Gate Turn-off • **Commutating Circuits:** ▪ Voltage Commutation ▪ Current Commutation ▪ Pulse Commutation ▪ Jones Commutation • **Protection of Power Semiconductor Devices:** ▪ Overvoltage Protection ▪ Overcurrent Protection ▪ Gate Protection ▪ Overtemperature Protection
3.	**Uncontrolled Rectifiers:** • **Introduction** • **Half-Wave Rectifier:** ▪ Half-Wave Rectifier with Resistive Load ▪ Half-Wave Rectifier with Resistive-Inductive Load • **Full-Wave Rectifier:** ▪ Centre-Tapped Full-Wave Rectifier ▪ Full-Wave Bridge Rectifier ▪ Full-Wave Bridge Rectifier with Resistive-Inductive Load • **Three-Phase Rectifiers:** ▪ Three-Phase Half-Wave Rectifier ▪ Three-Phase Centre-Tapped Full-Wave or Six-Phase Half-Wave Rectifier ▪ Three-Phase Bridge Rectifier ▪ Three-Phase Double-Star Rectifier ▪ Three-Phase Twelve-Pulse Full-Wave Bridge Rectifier
4.	**Controlled Rectifiers:** • **Introduction**

	• **Half-Wave Controlled Rectifiers:** ▪ Half-Wave Controlled Rectifier with Resistive Load ▪ Half-Wave Controlled Rectifier with Resistive-Inductive Load ▪ Half-Wave Controlled Rectifier with Inductive Load and Flywheel Diod • **Full-Wave Controlled Rectifiers:** ▪ Mid-Point Configuration with Resistive Load ▪ Full-Wave Controlled Rectifier with Transformer Leakage Reactance and Load Reactance ▪ Full-Wave Controlled Bridge Rectifiers • **Dual Converter** • **Three-Phase Controlled Rectifiers:** ▪ Three-Phase Half-Wave Controlled Rectifier ▪ Six-Phase Half-Wave Controlled Rectifier ▪ Three-Phase Fully-Controlled Bridge Rectifier ▪ Six-Phase Full-Wave Controlled Bridge Rectifier

Reference Books:

1. Power Electronics and It's Applications by Alok Jain, Penram International (India) Pvt. Ltd.
2. An Introduction to Thyristors and Their Applicationsl M. Ramamoorty; Palgrave Macmillan
3. Thyristors and Their Applications by M. Ramamoorty; East West Press Pvt.
4. Thyristors: Theory and Apllication by R. K. Sugandhi and K. K. Sugandhi; New Age International
5. Modern Power Electronics by P. C. Sen; S Cand Group