

## POWER ELECTRONICS

EE 504

**Credit: 4**

### Introduction:

Concept of power electronics, application of power electronics, uncontrolled converters, advantages and disadvantages of power electronics converters, power electronics systems, Power diodes, Power transistors, Power MOSFETS, IGBT.

### PNPN devices:

Thyristor, brief description of members of Thyristor family with symbol, V-I characteristics and applications. Two transistor model of SCR, SCR turn on methods, switching characteristics, gate characteristics, ratings, SCR protection, series and parallel operation, gate triggering circuits. Different commutation techniques of SCR.

### Phase controlled converters:

Principle of operation of single phase and three phase half wave, half controlled, full controlled converters with R, R-L and RLE loads, effect of free wheeling diodes and source inductance on the performance of converters. External performance parameters of the converters, techniques of power factor improvement, Single phase and three phase dual converters, Resonant converters.

### DC-DC converters:

Principle of operation, control strategies, step up choppers, types of choppers circuits based on quadrant of operation, performance parameters, multiphase choppers and switching mode regulators.

### Inverters:

Definition, classification of inverters based on nature of input source, methods of commutation and connections. Principle of operation with R and R-L loads, three phase full bridge inverters, performance parameters of inverters, methods of voltage control and harmonic reduction of inverters.

### AC controllers:

Principle of on-off and phase control, single phase and three phase controllers with R and R-L loads.

Principle of operation of Cycloconverters, circulating and non circulating mode of operation, single phase to single phase step up and step down Cycloconverters, three phase to single phase Cycloconverters, three phase to three phase Cycloconverters.

### Applications:

Speed control of AC and DC motors, HVDC transmission, static circuit breaker, UPS, static VAR controller.