

PEEL5303: **ELECTRIC DRIVES** (3-0-0)

Module-I

(12 Hours)

Study of Motor Drives: Electrical Drives, Advantages of Electrical Drives, Electrical Motors, Power Modulators, Choice of electrical Drives, Fundamentals of Torque Equations, Speed Torque Conventions and Multi-quadrant Operation, Equivalent Values of Drive Parameters, Components of Load Torques, Nature and Classification of Load Torques, Calculation of Time and Energy Loss in Transient Operations, Steady State Stability, Load Equalization, Control of Electrical Drives, Thermal Model of Motor for Heating and Cooling, Classes of Motor Duty, Determination of Motor Rating.

Book-1:Ch. 1.1, Ch. 1.2, Ch. 1.3, Ch. 1.4; Ch. 2.1, Ch. 2.2, Ch. 2.3, Ch. 2.4, Ch. 2.5, Ch. 2.6, Ch. 2.7, Ch. 2.8; Ch. 3.3, Ch. 4.1; Ch. 4.2, Ch. 4.3.

Module-II

(14 Hours)

Steady State Performance of DC/AC Drives: Closed Loop Control of Drives, DC Motors and their Performances, Starting, Braking, Transient Analysis, Speed Control, Methods of Armature Voltage Control, Transformer and Uncontrolled Rectifier Control, Controlled Rectifier Fed DC Drives, Chopper Controlled DC Drives.

Induction Motor Drives: Speed Control, Pole Changing, Pole Amplitude Modulation, Stator Voltage Control, Variable Frequency Control from Voltage Source, Voltage Source Inverter Control, Variable Frequency Control from Current Source, Current Source Inverter Control, Current Regulated Voltage Source Inverter Control, Rotor Resistance Control, Slip Power Recovery.

Synchronous Motor Drives: Synchronous Motor Variable Speed Drives, Variable Frequency Control of Multiple Synchronous Motors.

Book-1:Ch. 5.1, Ch. 5.2, Ch. 5.3, Ch. 5.4, Ch. 5.5, Ch. 5.6, Ch. 5.8, Ch. 5.9, Ch. 5.10, Ch. 5.11, Ch. 5.12, Ch. 5.13, Ch. 5.14, Ch. 5.15, Ch. 5.18, Ch. 5.19, Ch. 5.20, Ch. 5.21; Ch. 6.8, Ch. 6.9, Ch. 6.10, Ch. 6.11, Ch. 6.12, Ch. 6.13, Ch. 6.16, Ch. 6.17, Ch. 6.18, Ch. 6.20, Ch. 6.21; Ch. 7.3.1, Ch. 7.3.2, Ch. 7.4.

Module-III

(12 Hours)

Traction Drives: Nature of Traction Load, Calculation of Traction Drive Ratings and Energy Consumption, Tractive Effort and Drive Ratings, Specific Energy Consumption, Maximum Allowable Tractive Effort, Conventional DC and AC Traction Drives, 25 kV AC Traction using Semiconductor Converter Controlled DC Motors, DC Traction employing Polyphase AC Motors, AC Traction employing Polyphase AC Motors.

Book-1:Ch. 10.2, Ch. 10.6, Ch. 10.10, Ch. 10.12, Ch. 10.15, Ch. 10.16.

Drives for Specific Applications: Drive Considerations for Textile Mills, Steel Rolling Mills, Cranes and Hoist Drives, Cement Mills, Sugar Mills, Machine Tools, Paper Mills, Coal Mines, Centrifugal Pumps.

Book-2:Ch. 7.1, Ch. 7.2, Ch. 7.3, Ch. 7.4, Ch. 7.5, Ch. 7.6, Ch. 7.7, Ch. 7.8, Ch. 7.9.

Microprocessors and Control of Electrical Drives:

Dedicated Hardware Systems versus Microprocessor Control, Application Areas and Functions of Microprocessors in Drive Technology, Control of DC Drives using Microprocessors.

Book-2:Ch. 8.2, Ch. 8.3, Ch. 8.4.1.

Text Books:

- (1) Book-1: Fundamentals of Electrical Drives-By G.K.Dubey, Alpha Science International Limited, Pangbourne, UK, **Second Edition**, 2001.
- (2) Book-2: Electric Drives-Concepts and Applications- By Vedam Subramanyam, **Second Edition**, Tata McGraw Hill Publication, 2010-11.

Reference Book:

REFERENCE BOOK.

- (1) Modern Power Electronics and AC drives- by B.K.Bose, Pearson Education.