



FUNDAMENTALS OF ELECTRIC DRIVES

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IIT Kanpur

TYPE OF COURSE : New | Elective | UG/PG

COURSE DURATION : 8 weeks (29 Jul'19 - 20 Sep'19)

EXAM DATE : 29 Sep 2019

PRE-REQUISITES : Electrical Machines, Power Electronics

INTENDED AUDIENCE : UG and PG students in Electrical Engineering

INDUSTRIES APPLICABLE TO : GE Global Research, Hitachi Hi-Rel Power Electronics Pvt Ltd, Gandhi Nagar, Amtech Electronics (India) Ltd, etc

COURSE OUTLINE :

The course aims at giving a broad overview of Electrical Drive Systems. It is assumed that the students have prior exposure to Electrical Machines and Power Electronics. The control principles of various DC and AC motors using solid state converters are discussed. Principles of selection of Electric Motors are introduced. Some of the applications of Electrical Drives are also highlighted.

ABOUT INSTRUCTOR :

Prof. S. P. Das received the B.Tech. (with Honors) degree in Electrical Engineering, the M.Tech. degree in 'Machine Drive and Power Electronics' and the Ph.D. degree from the Indian Institute of Technology, Kharagpur, India, in 1990, 1992, and 1997, respectively. He has been with the Department of Electrical Engineering, IIT Kanpur since 1997. He has guided 7 PhD theses and over 50 M.Tech theses. His research interests include Power electronics, High performance industrial drives, Power quality conditioners, and Microprocessor-based control and instrumentation. He is a Senior Member of IEEE (USA) and a Fellow of Institute of Electronics and Telecom Engineers (IETE), India.

COURSE PLAN :

- Week 1 :** Introduction to Electrical Drives; Dynamics of Electrical Drives; Review of Torque-Speed Characteristics of DC Motors (Shunt and Series) including Motoring and Braking
- Week 2 :** Converter (Half Controlled Converter, Full Controlled Converter, Dual Converters); Control of DC Motor Drives; Torque Speed Characteristics of Converter-fed DC Drives
- Week 3 :** Chopper Controlled DC Drives (Single and Multi-quadrant Converters), Motoring and Braking operations
- Week 4 :** Induction Motor Drives – Equivalent circuits; Torque-speed characteristics; Operation of Induction Motor with Unbalanced Source Voltages; Analysis of Induction Motor from Non-sinusoidal Voltage Supply; Starting and Braking of Induction Motor
- Week 5 :** Stator Voltage Control of Induction Motor; Variable Voltage/ Current; Variable Frequency Control of Induction Motor Fed from VSI and CSI; Control of Slip-ring Induction Motor
- Week 6 :** Synchronous Motor Characteristics (Cylindrical and Salient Pole); CSI-fed Synchronous Motor Drive; Permanent Magnet Synchronous Motor Drive; Brushless DC Motor Drives
- Week 7 :** Traction Drives – Characteristics of Traction Drives; Drive Power Requirement; DC and AC Traction
- Week 8 :** Switched Reluctance Motor – Construction; Analysis and Closed-loop Control; Various Types of Stepper Motor and their Characteristics