



NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR, JHARKHAND – 831 014

Department of Electrical Engineering

SPRING SEMESTER 2019-20

Course Handout

Date: 01/01/2020

Course No. : EE4226
Course title : Advanced Machine Drive (3-0-1)
Instructor-in-charge : Mrs. Madhu Singh

Course description

Introduction: Drives Concept , different machine and load characteristics , equilibrium and steady state stability , section of machine , speed control methods, open loop and closed loop control methods, Principle of vector and field oriented control, Complex valued dq model of induction motor drives , Turn ratio and modified dq-model. Principle of vector oriented control of ac machines, current controllers in stationary and synchronous coordinates, Rotor flux oriented control of induction machines, Methods to estimation of rotor flux for vector control using current and voltage decoupling network,

Scope

- To provide a good fundamental concepts of electric drives and circuits
- To describe the importance of rating and characteristics of drives in selection for specific application.
- To study various circuit configurations, operation and analysis of machine drives.
- To study dc drives, ac drive and some non-drive applications of power converters.

Objectives

- At the end of this course, the students should be able to understand the importance of structure and characteristics of different machine drives in their practical applications.
- At the end of this course, the students should be able to analyze the operations and performance of different machine drives with different nature of load.
- At the end of this course, the students should aware of the advance motor drives control techniques.

Text book

- T1. G.K. Dubey , Power Semiconductor Controlled Drives
- T2. Muhammad H Rashid, Power Electronics, Circuits, Devices, and Applications, Pearson Prentice Hall, India, Third Edition, 2005
- T3. B K Bose, Power Electronics and AC Drives, Prentice Hall of India, New Delhi, 2005.

Reference books

- R1. W Leonard ,Control of Electric Drives, Springer- Verlag-1985.
- R3. L Umanand, Power Electronics, Essentials and Applications, Wiley India Pvt. Ltd, New Delhi.

Course Plan (EE4226)

Lecture No.	The Learning Objectives	Topics to be Covered	Refer to Chapter, See (Book)
1-2	To get an overview of different electric machine drives and characteristics and applications	DC and Ac drives	1 (T1)
3-6	To understand the machine drives and load characteristics. Equilibrium and steady state stability performance behaviour, four coordinates operation and selection of machines	machine drives and load characteristics. Equilibrium and steady state stability performance behaviour, four coordinates operation and selection of machines	2 (T1)
6-10	Open loop and closed loop control of dc motor drives using power electronics converters and real applications	Speed control of dc motor drives using single phase three phase full wave converter and choppers	5(T1) (T2)
11-16	Open loop and closed loop control of induction motor	Implementation of different method of scalar speed control for induction motor using power converters (voltage control, current control, v/f control, rotor resistance control)	6(T1) 8(T2) (R3)
17-18	To understand the basic theory and transformation of 3-phase voltage and current into dq quadrature reference frame	Transformation of 3 phase variables into dq stationary and synchronously rotating reference frame	2 (T3)
19-20	To understand the dq model of induction drives	Development of dq model of induction motor drives using dq equivalent circuit	2(T3)
21-24	To study and implementation of indirect vector control for induction motor drives.	Derivation of condition for implementation of indirect vector control of induction motor drive using dynamic equation	8 (T3)
25-28	To study and implementation of direct vector control for induction motor drives.	Derivation of condition for implementation of direct vector control of induction motor drive using dynamic equation	8 (T3)
29-30	To learn how implement indirect vector control of induction motor drive in MATLAB environment	Development and implementation of indirect vector control in MATLAB Simulink	8 (T3)
31-33	To learn how implement direct vector control of induction motor drive in MATLAB environment.	Development and implementation of direct vector control in MATLAB Simulink	8 (T3)
34-35	Methods of speed and Flux Estimation	Implementation of sensorless control technique using without flux and speed sensor	8(T3)
36-40	To study the types of synchronous motors; to study its control characteristics and the speed control methods. To understand the dq model of Synchronous motor drives	Basic Characteristics of Synchronous Motors; Operating Modes; Converter-fed Drives	7(T7) 2- 8 (T3)

Evaluation Schemes (ES)

EC No.	Evaluation Components	Duration	Weightage	Date & Time	Nature of the components
1	Mid Semester	02 Hr	30%	-----	Closed book
2	Teacher assessment		20%	Tutorial period	Assignment & Seminar etc.
3	End Sem Exam	3 Hrs	50%	-----	Closed book

Notices: All notices regarding the course work will be displayed only on Notice Board of Electrical Engineering Department.

Instructor In-charge
EE601