RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/7

Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	Sixth

Course Code	612	Course Name	Industrial Drives

Course Outcome - 1	Select motors according to drive technology, their characteristics and speed control methods	**Teach Hrs**	**Marks**
Learning Outcome E0561211	Explain fundamentals of electric drive. (Cognitive domain)	**6 Hrs**	**10 Marks**
Contents	• **Electric Drive:** Introduction, Need, Type and Advantages • Need for Accurate Speed Control, Concept of Electric Drive, Trends in Drive Technology, • Classification of Drives, Group Drive, Individual Drive		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561212	Interpret characteristics of motors and speed control methods. (Cognitive domain)	**6 Hrs**	**10 Marks**
Contents	**Motor Characteristics (Torque & Speed) & Speed Control Methods:** • DC Motors: Shunt Motor, Series Motor, Compound Motors, • AC Motors: Induction Motors, Synchronous Motors		
Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0561213	Perform speed control of a given motor. (Psychomotor domain)	**6 Hrs**	**10 Marks**
Contents	• To perform speed control of DC motors. • To perform speed control of induction motor.		
Method of Assessment	External: Performance of given task and viva voce.		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	Sixth

Course Code	612	Course Name	Industrial Drive

Course Outcome -2	Justify the selection criteria for electrical drive	Teach Hrs	Marks
Learning Outcome E0561221	Classify braking systems of motor. (Cognitive domain)	6 Hrs	10 Marks
Contents	• Requirements of braking system. • Types of mechanical braking. • Types of electrical braking. • Comparison of braking methods in induction motors • Dynamics of braking		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561222	Select suitable motor based on electrical characteristics, applications and type of load. (Cognitive domain)	6 Hrs	10 Marks
Contents	• **Selection of Motors:** Introduction, Electrical Characteristics, Selection of Motor for Different Applications, Motors for Particular Services. • Types of Load: Sign Convention of Torque and Speed. • Quadrantal Diagram of Speed-Torque Characteristics.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561223	Demonstrate electrical braking. (Psychomotor domain)	5 Hr	10 Marks
Contents	• To demonstrate electrical braking methods		
Method of Assessment	Internal: Performance of given task and viva voce.		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	Sixth

Course Code	612	Course Name	Industrial Drive

Course Outcome –3	Use various drives for speed controls of DC motor	Teach Hrs	Marks
Learning Outcome E0561231	Explain various solid state speed controls of single and three phase DC drives. (Cognitive domain)	**6 Hrs**	**10 Marks**

Contents	• Single-phase Controlled Converter Feeding Motor Load
	• Single-phase Drives for Separately Excited DC Shunt Motor:
	  ➢ Full-wave-converter Drives
	  ➢ Dual-converter Drives
	• Three-phase Drives for Separately Excited DC Shunt Motor
	  ➢ Half-wave Converter Drives
	  ➢ Full-wave Converter Drives
	  ➢ Dual-converter Drives
	(**Circuit diagram and working only**)		

Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561232	Describe four quadrant operation of motor and speed control of chopper controlled DC drives. (Cognitive domain)	**6 Hrs**	**10 Marks**

Contents	**Circuit diagram and working of:**
	• Four Quadrant Operation of Separately Excited DC Shunt Motor Fed by Fully-controlled Rectifier
	• Rectifier Control of DC Series Motor
	• Chopper Control of DC motor:
	  ➢ Separately Excited DC Shunt Motor
	  ➢ DC Series Motor
	(**Circuit diagram and working only**)		

Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0561233	Perform speed control of a given DC motor using drive. (Psychomotor domain)	**7 Hrs**	**10 Marks**
Contents	• To control the speed of DC motor using single phase full/ dual converter drive. • To control the speed of DC motor using three phase full/ dual converter drive. • To control the speed of DC motor using chopper drive. **(Perform at least one or more practical exercises depending upon the availability of resources)**		

Method of Assessment	External: Performance of given task and viva voce.

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Branch	**ELECTRICAL & ELECTRONICS ENGINEERING**	**Semester**	**Sixth**
Course Code	**612**	**Course Name**	**Industrial Drive**

Course Outcome –4	Use various drives for speed control of three phase induction motor	**Teach Hrs**	**Marks**
Learning Outcome E0561241	Illustrate solid state speed control of a 3 phase induction motor by voltage control and frequency control method. (Cognitive domain)	**6 Hrs**	**10 Marks**
Contents	• Basic principle of 3 phase induction motor drive. • Solid state control of 3 phase induction motor: ➢ Stator voltage control by AC voltage controller. ➢ Stator variable frequency control: ▪ voltage source inverter- PWM drives ▪ current source inverter drives ▪ cycloconverter fed IM drive (**Circuit diagram and working only**)		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561242	Explain solid state speed control of a 3 phase induction motor by variable frequency drive and rotor resistance control method. (Cognitive domain)	**6 Hrs**	**10 Marks**
	Solid state control of 3 phase induction motor: • Stator voltage and frequency control - ▪ Basics of V/f drive ▪ scalar control of drives ▪ vector- field oriented control of drives (block diagram only) • Static rotor resistance control ➢ Slip power control – ▪ Static Kramer and ▪ Static Scherbius drive (**Block diagram and working only**)		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561243	Perform solid state speed control of 3 phase induction motor using given method. (Psychomotor domain)	**7 Hrs**	**10 Marks**
Contents	• To perform solid state speed control of 3 phase induction motor using stator voltage control. • To perform speed control of 3 phase induction motor using V/f drive • To perform slip power control of 3 phase induction motor using Static		

	Kramer or Static Scherbius drive **(Perform at least one or more practical exercises depending upon the availability of resources)**
Method of Assessment	Internal: Performance of given task and viva voce.

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	Sixth

Course Code	612	Course Name	Industrial Drive

Course Outcome –5	Select suitable derive for synchronous motor and advance electrical motor	Teach Hrs	Marks
Learning Outcome E0561251	Explain the working of synchronous motor drives. (Cognitive domain)	6 Hrs	10 Marks
Contents	• Variable frequency control of synchronous motor drive • Vector control of synchronous motor • Self-controlled synchronous motor drive employing load commutated thyristor inverter (**Block diagram and working only**)		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0561252	Describe the working of various advance electrical motor drive. (Cognitive domain)	6 Hrs	10 Marks
Contents	• Brushless DC motor drive • Stepper motor drive • Permanent magnet synchronous motor (PMSM) drive • Switched reluctance motor drive (**Block diagram and working only**)		
Method of Assessment	Internal: Assignment and Quiz		
Learning Outcome E0561253	Demonstrate operation of a given motor using drive. (Psychomotor domain)	5 Hrs	10 Marks
Contents	• To perform operation of synchronous motor drive • To perform operation of Brushless DC motor drive/ Stepper motor drive /PMSM drive/ Switched reluctance motor drive **(Perform at least one or more practical exercises depending upon the availability of resources)**		
Method of Assessment	External: Performance of given task and viva voce.		

REFERENCE BOOKS:

S.N.	Title & Publication	Author
1.	Fundamentals of industrial drives, PHI publication, New Delhi	B.N. Sarkar
2.	Fundamentals of electrical drives, Narosa Publication, New Delhi	G. K. Dubey
3.	Power Electronics, Khanna Publishers, New Delhi	P. S. Bimbhra
4.	Power Electronics, Publisher: Tata McGraw-Hill Publishing limited, New Delhi	P. Sen
5.	A first course on Electrical Drives, Wiley Eastern Ltd. New Delhi,	S. K. Pillai
6.	Power Electronics and Drives, Publication: MNPERE, USA	Ned Mohan
7.	Electric motor and Drives, fundamental, types and application, Publication: Elsevier	Austin Huges
8.	Elementary concepts of Power Electronic Drives, CRC Press	K. Sundareswaran
9.	Modern Power Electronics and AC Drives, Prentice Hall	Vimal K. Bose