SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B. Tech. Semester VII

Subject Name: Advanced Electrical Drives **Subject Code: BTEL14743**

Type of course: **Professional Elective Courses**
Prerequisite: **Power Electronics and Electrical Machines**
Rationale: Electric drives seemingly are utilized in all industries including the Electric and hybrid vehicles. Electric drive using power electronic converters with suitable control strategy can control the speed and torque of electric motor precisely. The course is aimed to provide exposure about the commonly used power electronic converters for electric drive applications and various control strategies used for the purpose of motion control.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15			

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**INDUCTION MOTOR DRIVES** Different transformations and reference frame theory, concept of space vector, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC). Sensorless control, doubly fed induction machine, CSI fed induction motor drives, Applications.	18	40
2.	**SYNCHRONOUS MOTOR DRIVES** Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.	10	22
3.	**PERMANENT MAGNET MOTOR DRIVES** Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.	08	18
4.	**SWITCHED RELUCTANCE MOTOR DRIVES**	09	20

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	Evolution of switched reluctance motors, various topologies for SRM drives, comparison, Closed-loop speed and torque control of SRM.		

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**20**	**20**	**20**	**20**	**00**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

1. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, Asia, 2003.
2. P.C. Krause, O. Wasynczuk and S.D. Sudhoff, "Analysis of Electric Machinery and Drive Systems", John Wiley & Sons, 2013.
3. H. A. Taliyat and S. G. Campbell, "DSP based Electromechanical Motion Control", CRC press, 2003.
4. R. Krishnan, "Permanent Magnet Synchronous and Brushless DC motor Drives", CRC Press, 2009

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Apply the theory of transformations to derive the dynamic (dq0) model of an induction motor	20
CO-2	Implement Direct and indirect Vector control for induction motor and the PMSM drives and the Direct Torque Control for Induction Motor Drives	40
CO-3	Implement V/f control for synchronous drives and learn various control strategies	15
CO-4	Analyze BLDC and the SRM drives	15

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	**3**		**2**			**2**	**2**						**3**		

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CO-2	**3**		**3**	**2**	**3**						**2**		**3**	**3**	
CO-3	**3**	**3**	**2**	**3**	**3**						**2**		**3**	**3**	
CO-4	**3**	**2**	**2**		**3**						**2**		**3**	**3**	
CO-5	**3**	**2**	**2**	**3**	**1**	**2**	**2**		**2**				**3**	**2**	**3**
Rationale *															

Rationale*: Explaining why it is matching this particular program outcome

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1. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, Asia, 2003.
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3. R. Krishnan, "Permanent Magnet Synchronous and Brushless DC motor Drives", CRC Press, 2009.
4. Peter Vas, Vector Control of Electric Drives, Oxford Publishers, 1998.
5. G. K. Dubey, Fundamentals of Electrical Drives.,Narosa Publishing House, 2nd Edition, 2001.

List of Open Source/learning website:

- https://nptel.ac.in/courses/108/104/108104140/
- https://cusp.umn.edu/electric-machines-drives/electric-machines-drives

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