

Course Syllabus

Course Title: Electrical Machines	Course Code: EEL- 3003/ELE-3323	Credit Hours:	Pre-Requisites: EEL 2043
Instructor: Dr. Haris M. Khalid		Contact Info: hkhalid@hct.ac.ae , Website: www.harismkhalid.com	
Course Description:	<p>This course focuses on the construction, operation and testing of three-phase electrical machines.</p> <p>The physical concepts and basic laws governing electrical machines operation, such as Faraday's Law, Ampere-Biot-Savart's Law and Len's Law, are introduced and the principles underlying the performance of three-phase electrical machines are subsequently explained.</p>		
Teaching & Learning Methodologies:	<p>In this course, the student is focuses on the construction, operation and testing of three-phase electrical machines, which begins with understanding basic laws governing electrical machines operation. Then, students has to apply the basic law on three-phase machines to enhance his understanding. The three-phase induction machines and three-phase synchronous machines have been used to explore the knowledge he gains. The following activities has been performed to fulfill the target of this course:</p> <ol style="list-style-type: none"> 1. Describe the construction of simple magnetic circuits, both with and without an air gap. 2. Apply Faraday's Law of electromagnetic induction, Ampere-Biot-Savart's Law, and Lenz's Law to solve for induced voltage and currents in relation to simple magnetic circuits with movable parts. 3. Illustrate the principle of the electromechanical energy conversion in magnetic circuits with movable parts. 4. Explain how the pulsating and rotating magnetic fields are produced in distributed windings. 5. Explain how the pulsating and rotating magnetic fields are produced in distributed windings. 6. Calculate the slip of an induction machine given the operating and synchronous speeds. 7. Calculate and compare between different torques of a three-phase induction machine. 8. Develop and manipulate the equivalent circuit model for the three-phase induction machine. 9. Analyze, and test experimentally, the torque-speed and current-speed characteristics of induction machines. 10. Describe the construction of three-phase synchronous machines, particularly the rotor, stator windings and the rotor saliency. 11. Develop and manipulate an equivalent circuit model for the three-phase synchronous machine. 12. Perform open and short circuit tests in order to determine the equivalent circuit parameters of a synchronous machine. 13. Identify the applications of the three-phase synchronous machines in industry and utility 14. List and explain the conditions of parallel operation of a group of synchronous generators. 15. Evaluate the performance of the synchronous condenser and describe the power flow control between a synchronous condenser and the utility. 		
Course Resources:	Student: Instructor: P. C. Sen (1996): Principles of Electric Machines and Power Electronics, John Wiley & Sons Inc., ISBN: 9780471022954.		

CLO 1- Apply basic physical concepts to explain the operation and solve problems related to electrical machines. Explain the principles underlying the performance of three-phase electrical machines.

CLO 2- Analyze, operate and test three-phase induction machines.

CLO 3- Investigate the performance, design, operation, and testing of three-phase synchronous machines.

Assessment Strategy:

Quizzes: 10 %

Midterm I: 20 %

Midterm II: 20 %

Practical Investigations and Labs: 20 %

Final Exam: 30 %