Papua New Guinea University of Technology

Department of Electrical and Communication Engineering

Lesson Plan

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject** | Electrical Machines 11 | | | | **Subject Code** | | | | | EE351 | | | |
| **Semester/year** | 1/2016 | | | | **Date Prepared** | | | | | 29/06/2015 | | | |
| **Lecturer** | Ms Rani Maeaoka | | | | **Credit Hours (PS)** | | | | |  | | | |
| **Period** | 15 weeks | | | | **Credit Hours (EAS)** | | | | |  | | | |
| **Subject Synopsis** | -To explain rotating magnetic field.  -To explain theory and performance of synchronous machines; generators and motors  -To explain theory and performance of single phase induction motors | | | | | | | | | | | | |
| **Contact Hours** | Lecture: 3hours/week, Lab 3hours/week | | | | | | | | | | | | |
| **Evaluation** | 60% - Continuous , 40% -Written Examination | | | | | | | | | | | | |
| **Learning**  **Outcomes** | 1. Rotating magnetic field due to multiphase currents. 2. Application of rotating magnetic field: motor starting and armature reaction. 3. Types of rotating machine windings, slot specifications and define various slot pitches. 4. EMF generation. 5. Construction details of cylindrical and salient pole synchronous machines 6. Solve synchronous machine circuits 7. Develop phasor diagrams and power angle diagrams of synchronous machine current and voltage variables. 8. Construction features of induction motors 9. Solve motor circuits. 10. Learn about the torque –speed characteristics of various types of single phase motors. | | | | | | | | | | | | |
| **Assessment**  **Methods** |  | % | LO1 | LO2 | | LO3 | LO4 | LO5 | LO6 | | LO7 | LO8 | LO9 |
| Quiz1 | 5 | x |  | |  |  |  |  | |  |  |  |
| Lab | 10 |  |  | |  |  | x |  | |  |  |  |
| Test 1 | 15 | x | x | | x |  |  |  | |  |  |  |
| Test 2 |  |  |  | |  |  | x |  | |  |  |  |
| Assignment1 | 10 |  |  | |  |  |  | **x** | | **x** |  |  |
| Assignment 2 | 10 |  |  | |  |  |  |  | |  | x | x |
|  | Wrttn Exam | 40 | x | x | | x | x | x | x | | x | x | x |
| **References used in class** | 1. Electric machinery and Transformers, Guru, B.S.B-Mizinoghlu, M.R., Oxford University Press. 2. Introductory Circuit Analysis, Boylestad, Robert, L., 10th Pearson Education Inc., New Jersey,2003. | | | | | | | | | | | | |
| **Additional References** |  | | | | | | | | | | | | |

**Program Outcomes (Electrical and Communications Engineering)**

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| --- | --- |
| PO1 | An ability to apply the knowledge of mathematics, science and Engineering in all aspects of Electrical Engineering. |
| PO2 | An ability to design and conduct experiments, as well as to analyse and interpret data. |
| PO3 | An ability to design a system, component, or process to meet desired need within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. |
| PO4 | An ability to apply the techniques of using appropriate tools to investigate, analyse, design, simulate and/or fabricate/commission complete systems. |
| PO5 | An ability to identify, analyse, formulate, design, simulate and/or fabricate/commission complete systems for engineering problems. |
| PO6 | An ability to communicate effectively and to prepare formal technical plans leading to solutions and detailed reports for electrical systems. |
| PO7 | An ability to work on multidisciplinary teams and comprehend his/her scope of work, deliverables and issues in which able to lead the team towards goal. |
| PO8 | Possess an understanding of professional, safety and ethical responsibility. |
| PO9 | Broad understanding of the impact of engineering solutions in a global, economic, environmental, and societal context. |
| PO10 | Recognition of the need for, and an ability to engage in life-long learning to upgrade to higher learning and research activities. |
| PO11 | Comprehensive knowledge of contemporary issues due to changing technical scenario. |
| PO12 | **An ability to manage projects in multidisciplinary environments and apply management** techniques, skills, and project management tools necessary for engineering practice. |

**Detailed Lesson Plan**

| **Chapter** | **Topic** | | **Week** | **Topic Outcomes (TO)** | | **LO** | | **PO** | | **Delivery Methods** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Basic concepts of rotating machines | | 1-4 | * Understand electromechanical energy conversion process * Rotating magnetic field; armature reaction * Emf generation * Rotating machine windings | | 1,2,3&4 | | 1&2 | | Lecture, & Tutorial |
| 2 | Synchronous generators | | 5-9 | * Synchronous generators construction features * Synchronous generator circuit analysis * Synchronous generator operating characteristics; phasor diagram and power angles * Open-circuit and Short-circuit performance characteristics * Conditions of parallel operation. | | 5,6,7 & 4 | | 1&2 | | Lecture, Tutorial& Lab |
|  | Mid-Semester Break | | | | | | | | |  |
| 3 | Synchronous motors | 10-11 | | | * Construction features * Circuit analysis * Analyse Speed /torque characteristics * Applications | | 5,6,7 & 4 | | 1&2 | Lecture, Tutorial |
| 4 | Single phase Induction Motors | 12-15 | | | * Construction features * Methods of starting * Circuit analysis * Analyse Speed /torque characteristics | | 8,9 & 10 | | 1&2 | Lecture, Tutorial |

**Assessment Details**

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| --- | --- | --- | --- |
| **Assessment Details** | | | |
| **Type** | **Group/ Individual** | **Learning Domain** | **Mark (%)** |
| Quiz | Individual | Cognitive | 10 |
| Assignment | Group/Individual | Psychomotor | 10 |
| Test | Individual | Cognitive | 10 |
| Lab s | Group/Individual | Psychomotor | 10 |
| Final Exam | Individual | Cognitive | 60 |
|  |  |  |  |

**Assessment Schedule:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Week No.** | | | | | | | | | | | | | | | |
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Assessment Methods | Quiz |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Assignment |  |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |
| Test 1 |  |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |
| Test 2 |  |  |  |  |  |  |  |  |  |  |  |  | x |  |  |  |
| Lab |  |  |  |  | x | x | x | x | x | x | x | x | x | x | x |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Exam |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | x |

**LO-PO Mapping:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Programme Outcomes (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 |
| Learning Outcomes LOs | LO 1 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 2 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 3 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 4 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 5 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 6 | x | x |  |  |  |  |  |  |  |  |  |  |
| LO 7 | x | x |  |  |  |  |  |  |  |  |  |  |
|  | LO 8 | x | x |  |  |  |  |  |  |  |  |  |  |
|  | LO 9 | x | x |  |  |  |  |  |  |  |  |  |  |
|  | 10 | x | x |  |  |  |  |  |  |  |  |  |  |

Prepared By: Checked & Approved By:

RANI MAEAOKA

(Head of the Department ECE)

Date: Date:

**9/3/2015**