Papua New Guinea University of Technology

Department of Electrical and Communication Engineering

Lesson Plan

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Subject** | Electrical Design I | | | | **Subject Code** | | | | | EE421 | | | |
| **Semester/year** | 1/2016 | | | | **Date Prepared** | | | | | 01/03/2016 | | | |
| **Lecturer** | Ms Rani Maeaoka | | | | **Credit Hours (PS)** | | | | |  | | | |
| **Period** | 15 weeks | | | | **Credit Hours (EAS)** | | | | |  | | | |
| **Subject Synopsis** | Teach student on: the philosophies of engineering design practices, design and construction features of electrical machines, and to enable them to provide technical specifications for machines using available machines standards. | | | | | | | | | | | | |
| **Contact Hours** | Lecture: 3hours/week | | | | | | | | | | | | |
| **Evaluation** | 100% - Continuous | | | | | | | | | | | | |
| **Learning**  **Outcomes** | 1. Learn about the design and constructional features of power transformers such as the core structures, cooling system, windings and rating specifications. 2. Learn about single and double layer rotating machine windings 3. Learn about the design and constructional features of induction motors such as the core structures, cooling system, windings and rating specifications. 4. Learn about the design and constructional features of synchronous generators and synchronous motors such as the core structures, cooling system, windings, excitation systems and rating specifications. 5. Be familiar with concepts of design philosophy 6. Appling Engineering design philosophy in complex problem-solving activities to solve certain engineering assignments to satisfy specific human or organizational requirements or needs. | | | | | | | | | | | | |
| **Assessment**  **Methods** |  | % | LO1 | LO2 | | LO3 | LO4 | LO5 | LO6 | |  |  |  |
| Assignment | 10 | X |  | |  |  |  |  | |  |  |  |
| Test 1 | 10 | x |  | |  |  |  |  | |  |  |  |
| Test 2 | 10 |  | x | | x |  |  |  | |  |  |  |
| Assignment | 20 |  |  | |  | x |  |  | |  |  |  |
| Quiz | 40 |  |  | |  |  | x | x | |  |  |  |
| Major test | 40 | x | x | | x | x | x | x | |  |  |  |
| **References used in class** | 1. Say, M.G., Alternating current machines, Pitman Publishing Ltd, ELBS edition, 1981. | | | | | | | | | | | | |
| **Additional References** | 1. Electric machinery and Transformers, Guru, B.S.B-Mizinoghlu, M.R., Oxford University Press. | | | | | | | | | | | | |

**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**

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| Chapter | Topic | Week | Topic Outcome | LO | PO | **Delivery Methods** |
| 1 | Transformer Design and construction | 1-3 | * Parts of transformers and their functions * Specifying transformer ratings using physical dimensions of parts * Determine axial and radial forces * Specifying transformer reactance using physical dimensions of relevant parts | 1&2 | 4,5,6&7 | Lecture  &  Tutorials |
| 2 | Induction Motor Design and Construction | 4-7 | * Parts of motors and their functions * Frame sizes * Windings * Specifying motor reactance and resistances using physical dimensions of relevant parts * Cooling * Motor rotor types and their typical applications | 3, 4 & 5 | 4,5,6&7 | Lectures,  Tutorials |
| 3 | Synchronous generators Design and Construction | 8-11 | * Parts of generator and their functions * Windings, slots and pitch design * Specifying generator reactance and resistances using physical dimensions of relevant parts * Cooling * Excitation and controls | 6 & 7 | 4,5,6&7 | Lectures,  Tutorials |
| 4 | Synchronous Motors Design and Construction | 12 | * Parts of generator and their functions * Practical applications | 8 | 4,5,6&7 | Lectures,  Tutorials |
| 5 | Philosophy of engineering design | 13-14 | * Discus practical example of design processes involving:  1. Generator design and 2. Power system design | 9 | 4,5,6&7 | Lectures,  Tutorials |

**Assessment Details**

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| **Assessment Details** | | | |
| **Type** | **Group/ Individual** | **Learning Domain** | **Mark (%)** |
| Quiz | Individual | Cognitive | 5 |
| Assignments | Group/Individual | Psychomotor | 25 |
| Test1 | Individual | Cognitive | 30 |
| Main exam | Group/Individual | Psychomotor | 40 |

**Assessment Schedule:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Week No.** | | | | | | | | | | | | | | | |
|  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Assessment Methods | Assignment 1 |  | x |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Quiz |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |  |
| Assignment 2 |  |  |  |  |  |  |  |  | x |  |  |  |  |  |  |  |
| Test 1 |  |  |  |  |  | x |  |  |  |  |  |  |  |  |  |  |
| EXAM |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |  |
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**LO-PO Mapping:**

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|  |  | 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 | X | X |  |  |  |  |  |
| LO 2 |  |  |  | X | X | X | X |  |  |  |  |  |
| LO 3 |  |  |  | X | X | X | X |  |  |  |  |  |
| LO 4 |  |  |  | X | X | X | X |  |  |  |  |  |
| LO 5 |  |  |  | X | X | X | X |  |  |  |  |  |
| LO 6 |  |  |  | X | X | X | X |  |  |  |  |  |
| LO7 |  |  |  | X | X | X | X |  |  |  |  |  |
|  | LO8 |  |  |  | X | X | X | X |  |  |  |  |  |
|  | LO9 |  |  |  | X | X | X | X |  |  |  |  |  |
|  | LO10 |  |  |  | X | X | X | X |  |  |  |  |  |

Prepared By: Checked & Approved By:

RANI MAEAOKA

(Head of the Department ECE)

Date: 09/03/2016 Date: