

Module (Course Syllabus) Catalogue

2022 – 2023

| | | |
|---------------------------------|---|---|
| College/ Institute | Erbil Technical Engineering College | |
| Department | Mechanical and Energy Engineering | |
| Module Name | Electrical Machines | |
| Module Code | ELM504 | |
| Degree | Technical Diploma <input type="checkbox"/> Bachelor <input checked="" type="checkbox"/> High Diploma <input type="checkbox"/> Master <input type="checkbox"/> PhD <input type="checkbox"/> | |
| Semester | 5 th | |
| Qualification | M.Sc. in Electrical Engineering, Power Electronics, Gazi University, Ankara/TURKEY, 2001. | |
| Scientific Title | Assistant Lecturer | |
| ECTS (Credits) | 6 | |
| Module type | Prerequisite <input type="checkbox"/> | Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/> |
| Weekly hours | 4 | (163) Total hrs Workload |
| Weekly hours (Theory) | (2)hr Class | |
| Weekly hours (Practical) | (2)hr Class | |
| Number of Weeks | 20 | |
| Lecturer (Theory) | Zana Kanaan Shakir | |
| E-Mail & Mobile NO. | zana.shakir@epu.edu.iq , 07504537351 | |
| Lecturer (Practical) | Zana Kanaan Shakir | |
| E-Mail & Mobile NO. | zana.shakir@epu.edu.iq , 07504537351 | |
| Websites | | |

Course Book

| | | | | | |
|------------------------------------|--|-----------------------|-----------------|----------------------------------|---------------|
| Course Description | <p>Electric and Electronic Engineering is a 6-credit undergraduate level course (2 hours for Theoretical and same for Laboratory Tests). Dealing with the behaviour of motors and electronic devices in field applications. This course deals with DC motor, the three phases and fractional single phase Induction motor (Modelling and performance Characteristics for steady state operation and their applications) and behaviour of semi-conductor electronic devices with its application in drive.</p> | | | | |
| Course objectives | <p>Students must demonstrate the ability to:</p> <p>(1) The principle & operation of DC Motor, (2) The principle & operation of single-phase induction motor, (3) The principle & operation of three phase induction motor, starting methods, torque, slip characteristics, (4) The principle & operation of Transformer and (5) electrical measurement devices, cable consideration and operational amplifier.</p> | | | | |
| Student's obligation | <p>Student's obligation in the Electrical Engineering course is:</p> <ul style="list-style-type: none"> • Attendance in the all lectures. • Five or more quizzes in each course. • Exam in end of first course and second course. | | | | |
| Required Learning Materials | <ul style="list-style-type: none"> • Using data show, white board and PowerPoint, Testing in department's Laboratory. • Publish all lecture notes in college web side. | | | | |
| Evaluation | Task | Weight (Marks) | Due Week | Relevant Learning Outcome | |
| | Paper Review | | | | |
| | Assignments | Homework | 5 | 5, 7 | 1, 2, 3, 4, 5 |
| | | Class Activity | 2 | 1 – 9 | 1, 2, 3, 4, 5 |
| | | Report | | | |
| | | Seminar | 5 | 8 | 2, 3, 4, 5, 6 |
| | | Essay | x | x | |
| | | Project | 5 | 7 | 2, 3, 4, 5, 6 |
| | Quiz | | 8 | 5, 6, 7, 8 | 2, 3, 4, 5 |
| | Lab. | | 10 | 2, 3, 4, 5, 6, 7, 8 | 2, 3, 4, 5 |
| | Midterm Exam | | 25 | 10 – 12 | |
| | Final Exam | | 40 | 18 – 20 | |
| | Total | | 100 | | |

| | | |
|---|---|-------------------------|
| Specific learning outcome: | <ol style="list-style-type: none"> 1. Use, verify, and maintain instrumentation equipment and systems. 2. Understand the construction, operating principle and characteristics of DC machine, single phase transformer and three phase induction motor. 3. Prepare circuits for starting and speed control of DC machine and three phase induction motor. 4. Identify the parameters of Induction Machine. 5. Identify the parameters of single-phase transformer by test. | |
| Course References: | <ol style="list-style-type: none"> 1. Text book of Electrical Technology, by B.L. Theraja. 2. Power electronics, circuit, device & application, by Rashid <p>Other course reading list and references:</p> <p>Key references:</p> <ol style="list-style-type: none"> 1. Electrical Machine, by S. N. Ali 2. Electronic Devices & Circuits by J.B. Gupta 3. Handbook of Electronics Engineering by MADE EASY PUBLICATIONS. | |
| Course topics (Theory) | Week | Learning Outcome |
| D. C. Generator - construction – working principle - type of Generator. D. C. motors - construction – working principle - type of motors. Back e.m.f- speed of D.C. Motors-characteristics – speed control. Starting – starters – torque. Torque characteristic for all types of D.C motors. Speed control using field current for shut motor. Transformer. – construction – working principle – Losses. | 1 – 5 | 1, 2, 3 |
| Single phase induction motors – split phase – single phase motors torque speed characteristics. | 6 | 1, 2, 3, 4 |
| Three phase induction motors – construction – working principle. Synchronous speed – slip – example. Torque speed – slip – example. Power stages in an induction motor – efficiency- example. Three phase induction motors starting – direct starting example. Three phase I.M starting using resistance connected with rotor starting using star – delta method – example. | 7 – 12 | 1, 2, 3, 4, 5 |
| Practical Topics | Week | Learning Outcome |
| Speed control of D.C motors. | 1 | 2, 3 |
| D.C series motor load test | 2 | 2, 3 |
| D.C shunt motor load test | 3 | 2, 3 |
| D.C compound motor load test | 4 | 2, 3 |
| Shunt motor efficiency using no load test | 5 | 2, 3 |

| | | |
|---|---|---------|
| Starting I.M by using resistance with rotor | 6 | 2, 3, 4 |
| Blocked rotor test | 7 | 2, 3, 4 |
| Slip rings starting and speed control | 8 | 2, 3, 4 |
| Three phase I.M load test | 9 | 2, 3, 4 |

19. Examinations:

1. Theory questions:

Q1/ A 6 pole dc machine armature has 36 slots each slot containing 16 conductors and is wave wound. The flux per pole is 0.0188 *wb*. Find the gross torque and mechanical power output when the machine is operating as a motor at 1200 *rpm* with an armature input current of 10A.

HINT: Assume Mechanical Power = Electrical Power, that's means neglected the armature losses.

Q2/

- Explain power losses in the three phase induction motors. Also draw the power flow diagram?
- What is the condition for developing the maximum power in the DC motors?

Q3/ The power input to a 500V, 50Hz, 6 pole, 3 phase induction motor running at 975 *rpm* is 40kW. The stator losses are 1kW and the friction and windage losses total 2kW. Calculate:

- Slip.
- The rotor copper loss.
- Shaft power.
- The efficiency.

Extra notes:

External Evaluator

It's excellent and includes all requirements.

Hilmi

Assistant professor

Hilmi F. Ameen

Electrical Engineering Department

College of Engineering

University of Salahaddin