



MUTAH UNIVERSITY
Faculty of Engineering
Department of Electrical Engineering



Course Syllabus

| Course Code | Course Name | Credits | Contact Hours |
|-------------|-------------------------|---------|---------------|
| 0401587 | Power System Protection | 3 | 3T |

INSTRUCTOR/COORDINATOR

| | |
|---------------------|--|
| Name | Dr. Ziyad Almajali |
| Email | ziyad@mutah.edu.jo |
| Office Hours | 10:00-11:00 (Sun, Tues, Thur) |

TEXTBOOK

| | |
|----------------------------|--|
| Title | Power System Relaying |
| Author/Year/Edition | Stanley H. Horowitz and Arun G. Phadke, 2010, 4 th edition, Research Studies Press Ltd. |

Other Supplemental Materials

| | |
|----------------------------|--|
| Title (1) | Network Protection & Automation Guide |
| Author/Year/Edition | AREVA T & D, 2st Edition, 2015. |
| Title (2) | Protective Relaying Principles and Applications |
| Author/Year/Edition | J. Lewis Blackburn, , 3rd Ed, CRC Press, © 2007. |

SPECIFIC COURSE INFORMATION

A. Brief Description of the Content of the Course (Catalog Description)

Principles and components of power system protection; CTs and VTs, zones of protection; primary and backup protection; Relays operating and design: electromagnetic static, numerical; Relays types: over current, Earth-fault, directional, distance, and differential; Apparatus protection, circuit breakers; over voltage protection; system protection, relays co-ordinations.

B. Pre-requisites (P) or Co-requisites (C)

Power Systems (2) (0401482) (P)

C. Course Type (Required or Elective)

Required

SPECIFIC GOALS

A. Course Learning Outcomes (CLOs)

By the end of this course, the student should be able to:

CLO1: To understand the importance of power system protection in the continuity and reliability of power supply [1].

CLO2: To recognize the power system components and their protection system methods [1].

CLO3: To understand the function, design, and operation of protective system elements [1].

CLO4: To study different protection schemes, protection techniques, relays design and types [1].

CLO5: To equip students with skills and knowledge to select, apply and operate protection systems and to introduce the students to the modern trends and development in power system protection [3].

B. Student Learning Outcomes (SOs) Addressed by the Course

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| ✓ | | ✓ | | | | |

BRIEF LIST OF TOPICS TO BE COVERED

| List of Topics | No. of Weeks | Contact Hours |
|---|--------------|---------------|
| Unit 1: Introduction and philosophy of power system protection | 1 | 3 |
| Unit 2: Current and Voltage Transformers (CTs and VTs) | 1.5 | 4.5 |
| Unit 3: Operating Principles and Design of Protection Relays | 1.5 | 4.5 |
| Unit 4: Over-Current and Earth Fault Protection | 2 | 6 |
| Unit 5: Low voltage and Medium Voltage systems protection | 1.5 | 4.5 |
| Unit 6: Transmission line protection | 1.5 | 4.5 |
| Unit 7: Transformer protection | 2 | 6 |
| Unit 8: Rotating Machinery (Generator and Motor) Protection | 1.5 | 4.5 |
| Unit 9: Busbar, Reactor, and Capacitors protections | 0.5 | 1.5 |
| Unit 10: Overvoltage Protection : Protective devices and applications | 1 | 3 |
| Total | 14 | 42 |

| EVALUATION | | |
|---|--------------------------------------|-------------------|
| Assessment Tool | Due Date | Weight (%) |
| Mid Exam | According to the university calendar | 30 |
| Course Work (Homeworks, Quizzes, Projects, ...etc.) | One week after being assigned | 20 |
| Final Exam | According to the university calendar | 50 |

| ABET's Students Learning Outcomes (Criterion # 3) | | |
|--|-------------------------------------|---|
| Relationship to program outcomes | | |
| ABET 1-7 | Engineering Student Outcomes | |
| 1 | √ | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics |
| 2 | | an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. |
| 3 | √ | an ability to communicate effectively with a range of audiences. |
| 4 | | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |
| 5 | | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. |
| 6 | | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. |
| 7 | | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. |