



**MUTAH UNIVERSITY**  
**Faculty of Engineering**  
**Department of Electrical Engineering**



**Course Syllabus**

Course Code	Course Name	Credits	Contact Hours
0401540	Machines Controllers	3	3 T

**INSTRUCTOR/COORDINATOR**

<b>Name</b>	Dr.Talal Aljaafreh
<b>Email</b>	tmjaafreh@mutah.edu.jo

**TEXTBOOK**

<b>Title</b>	Control of electric machines
<b>Author/Year</b>	Irving L. Kosow, 2014

**Other Supplemental Materials**

<b>Title</b>	Electrical control of machines
<b>Author/Year</b>	Kenneth B. Rexford , 2010
<b>Electronic Materials</b>	

**SPECIFIC COURSE INFORMATION**

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

The course aims to design and modify electrical control circuits. It is also required to carry out trouble shooting in control circuits. To achieve these skills, it is necessary that he should be well deal with various types of motor starters and control systems used mainly in industry. Knowledge of static control of machines using Digital logic gates and programmable control of machines is also necessary as these are increasingly being used in industry today.

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

Microprocessors (0405476) (P)  
Industrial Electronics (0401465) (P)

**C. Course Type (Required or Elective)**

**Required**

**SPECIFIC GOALS**

**A. Specific Outcomes of Instruction**

**CLO1:** Students will identify the requirements for the efficient applications of electric machine controllers [1].

**CLO2:** Students will be adequately trained to design machine control systems [ 2].

**CLO3:** Students will understand the detailed aspects related to machine controllers and could take up research works in development in this area of work [7].

**B. Student 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
Control Components : Fuses, switches and fuse switch units, circuit breakers, contactors, contactor ratings, different types of relays, latching relay, frequency relays, Bimetallic Ratchet and Magnetic type overload relays. Thermal, pneumatic and electronic timers, phase failure relay , push button switches, drum switches, limit switches, speed actuating switches, solenoid valves, pressure switches, temperature switches, float switches, control transformer, symbols for various components, control diagrams.	2	6
Starters for 3 phase Squirrel Cage Induction Motors : Introduction, motor current at starting and during running. Manual and automatic primary resistor, increment resistor, line reactor and auto-transformer starters. Closed circuit transition auto-transformer starter, star-delta starter (open circuit and closed circuit transition). Two speed two winding and one winding motor starters. Forward/reverse starter.	2	6
Starters for Wound Rotor Induction Motors: Introduction, motor current at start and during running, manual starter using master controllers, definite time limit starters using individual timer and motor driven cam times for each step, secondary frequency acceleration starter.	2	6
Protection of Motor : Co-ordination of fuse, overload and contactor characteristics, Overload and short circuit protection, winding temperature protection, under voltage and phase failure protection.	1	3
Industrial Control Circuits	2	6

Introduction, planar machine, skip hoist, automatic control for a water pump, control of electrical ovens, overhead crane, battery operated truck, air compressor, conveyer system, elevator, trouble shooting in control circuits.		
Static Control of Machines : Advantages and disadvantages of static control compared to magnetic control. Development of simple control circuits using logic gates, off-return and retentive memory elements. Input and output devices for solid state logic circuits. Study of some industrial control circuits like product dispersion, product inspection conveyer system etc. using shift registers, counters, decoder, mono shot, clock, down counter and encoder.	3	9
Programmable Logic Controllers: Parts of a programmable controller, inputs/output section, central processing unit, input image table, output image table, user program memory, variable data memory, complete scan cycle, the programming terminals, programming basics, relay, timer, Counter and Sequencer type instructions, analogue operation.	3	9
<b>Total</b>	<b>15</b>	<b>45</b>

<b>EVALUATION</b>		
<b>Assessment Tool</b>	<b>Due Date</b>	<b>Weight (%)</b>
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

<b>ABET's Students Learning Outcomes (Criterion # 3)</b>		
<b>Relationship to program outcomes</b>		
<b>ABET 1-7</b>	<b>Engineering Student Outcomes</b>	
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.