Module (Course Syllabus) Catalogue
2023-2024

College/ Institute	**Erbil Technology College**	
Department	**Department of Automotive Industrial Technology**	
Module Name	**AC Electrical Circuit**	
Module Code	**AEC301**	
Semester	**3**	
Credits	**6**	
Module type	**Core**	
Weekly hours	**4**	
Weekly hours (Theory)	**(2)hr Class**	**(86)hr Workload**
Weekly hours (Practical)	**(2)hr Class**	**(64)hr Workload**
Lecturer (Theory)	**Truska Khalid M. Salih** **Zainab Pishtiwan Mahmood**	
E-Mail	**truska.muhamad@epu.edu.iq**	
Lecturer (Practical)	**Truska Khalid M. Salih** **Zainab Pishtiwan Mahmood**	
E-Mail	**truska.muhamad@epu.edu.iq**	

Course Book

Course Description	This course is a study of the fundamentals of alternating current (AC) including single phase and three phase circuit analysis techniques. Also is study the most important theories by reasonably brief outline of essential information, definitions, formula, and procedures with solved examples and unsolved ones for homework. .
Course Objectives	This subject is very important for the second year students of electrical power department to let them identifying the fundamental concepts, the electrical circuits the measurements which are the basic for studying and understanding all other subjects in both levels even in their career. The objective for the two term courses is to teach the students:- • The principles which describes the operation of AC circuits, sine wave, and types of connections of A.C. electrical circuits. • The most important theories by reasonably brief outline of essential information, definitions ,formula ,procedures with solved examples and unsolved ones for homework. • At the end of the course the student will have sufficient knowledge about different measurements and calculations which they need.
Student's Obligation	**Respect** A student has an obligation to exhibit honesty and to respect the ethical standards of the profession in carrying out his/her academic assignments. Without limiting the application of this principle. **Attendance** The student's absence must not exceed 10%. In the event that this percentage is exceeded, the student is considered to have failed in this module. **Questions** Asking questions about unclear material is an important part of the classroom experience. It is not uncommon for students to have similar difficulties, so speaking up will help everyone understand the discussed information. Teachers can also benefit

	from a student's questions. By finding out what subjects are hard to understand, instructors can adjust their lectures to clear up confusing topics. **Assignment** A student must submit the assignment on **moodle** app. every week and also write a report about what he/she was studied in the laboratory
Assessment Scheme	16% Mid Term (Theory and practical) 4% Quiz 40% Assignment (report, paper, homework, seminar...) 25% final practical 15% final theory
Specific Learning Outcome:	After successful completion of the course student will be able to ➢ Explains the basic definitions. ➢ Draws sinusoidal waveform and describes sinusoidal and non-sinusoidal alternative circuits. ➢ Defines amplitude, effective, mean, peak to peak value, frequency, and periodic signal. ➢ Demonstrate the phase and amplitude information of RLC in frequency domain. ➢ Draws phasor diagrams of RLC circuits. ➢ Explains capacitance, inductance, and admittance. ➢ Expresses sinusoidal terms as magnitude and phase. ➢ Defines complex number as rectangular and polar form. ➢ Solve serial and parallel ac circuits. ➢ Calculates equivalent impedance. ➢ Calculates current and voltage for each circuit element and shows them in complex domain. ➢ Draws power triangle and calculates power factor. ➢ Apply solving methods and theorem for ac circuits. ➢ Writes equation for node analysis. ➢ Solve circuit using star-delta transformation. ➢ Explains maximum power transformation. ➢ Explain the resonant frequency. ➢ Solve three phase circuits. ➢ Explains how obtain the voltage of three phase. ➢ Explains the star-delta connection. ➢ Explains the relationship between line and phase concepts. ➢ Calculates current, voltage, and power in three phase circuits

Course References:	• MEHTA, R. P. D. H. 2012. Basic Electrical Engineering, S. Chand Publishing. • BIRD, J. 2014. Electrical circuit theory and technology, Routledge. • DORF, R. C. 2018. The Electrical Engineering Handbook-Six Volume Set, CRC press.

Course Topics (Theory)	**Week**	**Learning Outcome**
AC Fundamentals Principle of generating an alternating voltage Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, Form factor, Peak Factor and Power Factor Vector representation of alternating quantities, addition, subtraction, multiplication and division.	1	
AC Series circuits Waveforms, phasor diagram and expression of voltage, current and power in pure: Resistance, Inductance, Capacitance AC through RL, RC, LC, RLC series circuit Resonant frequency and Resonance condition in RLC series circuit	2	
AC Parallel Circuits • Resistance and Inductance Parallel Circuits • Resistance and Capacitance Parallel Circuits • Capacitance and Inductance Parallel Circuits • Resistance, Inductance, and capacitance Parallel Circuits	3	
Power in Single Phase A.C. Circuit • Active or Real power (P) • Reactive Power (Q) • Apparent Power (S) • Power Triangle. • Power Factor (PF) • Homework	4	
Quiz Review and Solving Examples about Lectures(2,3,and 4)	5	
Resonance Circuits • A.C. Resonance Series Circuit • A.C. Resonance Parallel Circuit	6	

Superposition Theory in A.C. Circuits	7	
Poly Phase Circuits • Principle of Generation in Three Phase Alternating Voltage. • Line and Phase voltage, Line and Phase Current. • Three-Phase Star Connection. • Three Phase Delta Connection	8	
Convert Star Connection to Delta Connection and Vice Versa	9	
Power in Three Phase A.C. Circuits • Active or Real power (P) • Reactive Power (Q) • Apparent Power (S) • Power Triangle. • Power Factor (PF) • Homework	10	
Quiz Review and Solving Examples Lectures (8,9, and 10)	11	
Methods of Calculating the Power for 3-Phase Loads by Using the Wattmeter, the Connection for Calculating Active Power, Reactive Power and Apparent power.	12	
Solving examples Lecture 12.	13	
Practical Topics	**Week**	**Learning Outcome**
Sine wave experiment.	1	
Resistance &Capacitance in series (RC series) experiment. Resistance & coil in series (RL series)	2	
Resistance, Capacitance &Coil in Series (RLC series) Experiment.	3	
Resistance &Capacitance in Series (RC parallel) Experiment.	4	
Resistance &Coil in Series (RL parallel) experiment.	5	
Resistance, Capacitance &Coil in Parallel (RLC Parallel) Experiment.	6	

Maximum Power Transfer Theory's in (AC) Circuit Experiment.	7	
Series Resonance Circuit Experiment.	8	
Parallel Resonance Circuit Experiment.	9	
Calculating Phase Shift Experiment.	10	
Calculating Power by Using Wattmeter Experiment.	11	
Calculating Power without Wattmeter in (AC) Circuit Experiment.	12	