9/15/2022 DATE
☑ REQUIRED COURSE
☐ ELECTIVE COURSE

MSD DIVISION
☐ NEW COURSE
☑ REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	PHY-141		TITLE: *(30 Characters Max)*	University Physics II							
SEM CR HRS:	4	Lecture:	3	Lab:	3					ECH:	6
Course Level:	☑ Gen Ed / IAI ☐ Baccalaureate /Non-IAI	☐ Career/Technical ☐ Dev Ed/ Not in Degree Audit		Clinical Practicum:	0	Work-based Learning:	0			WBL ECH:	0
COURSE PCS #	11 - 40.0801		IAI Code	PHY912				Contact Hours (Minutes/Week)			
Repeatable (Y/N):	N	Pass/Fail (Y/N):	N	Variable Credit (Y/N):	N	Min:		Max:		16 Wks	300	8 wks	600
Prerequisites:	PHY-140 with grade of "C" or higher										
Corequisites:	MAT-242										
Catalog Description: (40 Word Limit)	This course is a study of heat, electricity, and magnetism for students in physics, engineering, chemistry, and mathematics.										

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Non-Clinical Internship/ SOE
Temperature, Heat and First Law	6	8		
Entropy and Second Law	4	4		
Kinetic Theory of Gases	3	4		
Elementary Concepts of Charge	2	2		
Electric Fields - Gauss's Law - Electric Potential	9	6		
Capacitors and Dielectrics	2	3		
Elementary Circuits	4	6		
The Magnetic Field and Ampere's Law	6	4		
Faraday's Law, Inductance, Oscillatory Circuits	5	5		
AC Circuits and a Summary of Maxwell's Equation	4	3		
TOTAL	45	45	0	0

EVALUTION							
QUIZZES	☑	EXAMS	☑	ORAL PRES	☐	PAPERS	☐
LAB WORK	☑	PROJECTS	☐	COMP FINAL	☑	OTHER	☑ homework

COURSE MATERIALS		
TITLE:	Fundamentals of Physics (Extended)	
AUTHOR:	Halliday, Resnick, & Walker	
PUBLISHER:	John Wiley & Sons	
VOLUME/EDITION/URL:	9th	
COPYRIGHT DATE:	2011	

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		The student will be able to:
Temperature, Heat and First Law Zeroth Law Celsius and Fahrenheit Scales Linear, Area, and Volume Expansion Conduction, Convection, and Radiation Heat Capacity and Latent Heat The Equation of State Van der Waals Gas Work of a Gas The First Law of Thermodynamics Isochoric, Isobaric, Isothermal, and Adiabatic Processes Cyclic Processes	14	Demonstrate and use different temperature scales. Demonstrate thermal expansion and heat transfer mechanisms. Demonstrate relationships between heat, work, and internal energy of a system. Calculate the heat, work, and change in internal energy for various thermodynamic processes and for cyclic processes.
Entropy and Second Law The Second Law of Thermodynamics and Heat Engines The Carnot Cycle Refrigerators and Heat Pumps The Absolute Temperature Scale and the Third Law of Thermodynamics Entropy: A State Variable Entropy Changes for Irreversible Processes	8	Demonstrate the concept of entropy and use it to apply to heat engines, refrigerators, reversible, and irreversible processes. Demonstrate efficiencies of various cyclical processes including the Carnot cycle. Calculate efficiencies of heat engines and refrigerators.

Kinetic Theory of Gases The Ideal-Gas Model Pressure and Molecular Motion Temperature and Molecular Motion The Equipartition-of-Energy Theorem Monatomic, Polyatomic, and Diatomic Gas Models The Maxwell Speed-Distribution Function Mean Free Path	7	Demonstrate the connection between microscopic motions of molecules and macroscopic quantities such as pressure and temperature. Demonstrate degrees of freedom as applied to different gases. Demonstrate the Maxwell Speed Distribution and mean free path and their applications.
Elementary Concepts of Charge Electric charge including continuous Charge Distributions Coulomb's Law	4	Demonstrate the concept of charge and charge transfer. Calculate the force between charges using Coulomb's Law.
Electric Fields – Gauss's Law – Electric Potential The Electric Field Point Charge Distributions Continuous Charge Distributions Electric Field Lines The Electric Dipole in a Uniform Electric Field Electric Flux Gauss's Law Gaussian Surfaces Coulomb's Law from Gauss's Law Electric Potential Energy The Electric Potential Electric Potential Change Due to a Uniform Electric Field Electric Potential Change in a Non-uniform Electric Field Computing the Electric Potential from a Charge Distribution Point-Charge Distributions Continuous Charge Distributions Computing the Electric Field from the Electric Potential The Relation Between V and E Equipotential Surfaces	15	Demonstrate the concepts of electric field and electric field lines and their connection to the force between particles. Calculate the electric field at points around various charge distributions. Demonstrate electric potential and electric potential energy. Calculate the electric potential around various charge distributions. Demonstrate the relationship between electric fields and voltage.
Capacitors and Dielectrics Capacitance Capacitors in Parallel, Series, and in Networks Energy Storage in a Capacitor Dielectrics	5	Demonstrate the basic operation and use of capacitors. Calculate the capacitance of capacitors in various situations. Demonstrate the effect of dielectrics on capacitance.
Elementary Circuits Electric Current and Current Density Resistivity and Resistance Temperature Dependence of Resistivity Energy Dissipation Electromotive Force Resistors in Series, Parallel and in Networks Multiple-Loop Circuits: Kirchhoff's Rules Potential Difference, Current, and Resistance Measurements Voltmeters Ammeters RC Circuits	10	Demonstrate how different circuit elements function and their uses. Analyze simple circuits using Ohm's Law and Kirchoff's Laws. Use a multimeter to find the voltage and current in different circuits.
The Magnetic Field and Ampere's Law The Magnetic Field Moving Charges in Uniform Magnetic Fields The Hall Effect Force on a Current-Carrying Conductor Current-Carrying Loops in a Uniform Magnetic Field The Magnetic Dipole Moment The Biot-Savart Law Ampère's Law The Solenoid The Toroid Magnetic Flux and Gauss's Law for Magnetism	10	Demonstrate magnetic fields and their uses. Calculate forces and magnetic fields around various current carrying circuit elements including loops, solenoids, and toroids. Use Ampere's Law to calculate magnetic fields for various situations.

Faraday's Law, Inductance, Oscillatory Circuits Faraday's Law Lenz's Law Induced Electric Fields Eddy Currents The Displacement Current Inductors LR Circuits Energy and the Magnetic Field LC Circuits Diamagnetic, Paramagnetic, and Ferromagnetic Phases	10	Demonstrate induction and be able to use Faraday's Law and Lenz's Law. Demonstrate the uses of inductors in simple circuits.
AC Circuits and A Summary of Maxwell's Equations RLC AC Circuits The Root-Mean-Square Potential and Current Power and Resonance in AC Circuits Transformers Filter Circuits Summary of Maxwell's Equations	7	Demonstrate oscillating circuits. Demonstrate the differences between DC and AC circuits. Demonstrate transformers.
	90	

Outcomes*	At the successful completion of this course, students will be able to:
Course Outcome	Apply the First Law of Thermodynamics.
Course Outcome	Demonstrate that heat engines are limited by the Second Law of Thermodynamics and that there is a simple formula for heat engine efficiency.
Course Outcome	Analyze simple circuits using Ohm's Law and Kirchoff's Laws and demonstrate how circuit elements like resistors and capacitors work.
Course Outcome	Demonstrate the relationship between electric fields and voltage.
Course Outcome	Demonstrate, and apply in applications, how a charged particle moves in an electric and/or magnetic field and how an electric and/or magnetic field is created.
Course Outcome	Demonstrate the four Maxwell equations (Gauss' Law of electric fields, the 'no-charge' Gauss' Law of magnetic fields, Ampere's Law, and Faraday's Law) in their integral format and use them in appropriate situations.
Course Outcome	Demonstrate the basic operation of an electric motor and an electric generator.
Course Outcome	Effectively communicate the objectives, procedures, and results of a simple scientific experiment.
Primary Laker Learning Competency	
Secondary Laker Learning Competency	

**Course and program outcomes will be used in the software for outcomes assessment and should include at least 1 primary and 1 secondary Laker Learning Competency. Limit to 3-5.*