COWLEY COLLEGE
& Area Vocational Technical School

COURSE PROCEDURE FOR

ENGINEERING PHYSICS II
PHS4561 5 Credit Hours

Student Level:
This course is open to students on the college level in the freshman or sophomore year.

Catalog Description:
PHS4561 - ENGINEERING PHYSICS II (N) (5 hrs)
[KRSN PHY 2030/2031/2032]
A continuation of PHS4560 Engineering Physics I. Topics include: electricity and magnetism—electric field, electric potential, current, electrical power, magnetic field, induction, and Maxwell's equations; optics—nature of light and wave optics; modern physics—special relativity, atomic structure, Schrodinger equation, quantum mechanics, and radioactivity.

Prerequisite:
MTH4440 Calculus II and MTH4460 Engineering Physics I

Controlling Purpose:
This course is designed to help the student increase their knowledge concerning the study of the mechanical and thermodynamic universe by theoretical derivation and practical applications in problem solving, laboratory study, and demonstration.

Learner Outcomes:
Upon completion of the course, the students who complete this course with a grade of A or B will have sufficient background for more advanced study in science and engineering programs requiring 5 credit hours of physics.

Units Outcomes and Criterion Based Evaluation Key for Core Content:
The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.

B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.

D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.

F = Failing, will be computed in GPA and hours attempted.

N = No instruction or training in this area.

CHAPTER 1: STATIONARY CHARGES AND ELECTRIC FIELDS

Outcomes: The student will acquire and understanding of the properties of stationary charges and electric fields.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe and solve applications of quantized electric charge.
						Evaluate continuous charge distributions.
						Evaluate charge problems by coulomb's law and the superposition principle.
						Describe and solve electric field applications from linear and non-linear charge distributions.
						Evaluate electric dipoles in uniform and non-uniform fields.

CHAPTER 2: GAUSS'S LAW

Outcomes: The student will acquire knowledge and understanding of Gauss's Law.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe and evaluate electric flux of Gaussian surfaces.
						Evaluate the Gaussian field from a surface charge distribution of a conductor.
						Evaluate Gaussian fields of ideal conductor models in electrostatic equilibrium.

CHAPTER 3: ELECTRIC POTENTIAL Outcomes: The student will acquire knowledge and understanding of electric potential.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Determine and evaluate the electric potential for two point charges.
						Interpret and evaluate the definition of electric potential as the volt.
						Relate the electric potential energy and the volt point charges and uniform electric fields.
						Evaluate the electric potential of a charge distribution in both uniform and non-uniform applications.
						Determine the electric field from the electric potential.
						Evaluate the equipotential surfaces of electric of charges.
						Understand and apply relaxation numerical methods for non-symmetrical potential surfaces.

CHAPTER 4: CAPACITANCE AND DIELECTRICS Outcomes: The student will acquire knowledge and understanding of Capacitance and Dielectrics.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Define and apply the concept of capacitance in conducting surfaces.
						Evaluate capacitance in plate, linear and non-linear conductors.
						Evaluate and solve applications of combinations of capacitors in electrical circuits.
						Evaluate energy in capacitors and solve applications in capacitors.

CHAPTER 5: ELECTRIC CURRENT AND RESISTANCE Outcomes: The student will acquire knowledge and understanding of Electric Current and Resistance.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Define and evaluate current and current density.
						Relate current density to an applied electric field.
						Define and evaluate resistance with respect to the shape of resistor.
						Understand and apply the concept of resistivity to a conductor.
						Evaluate energy dissipation in resistive materials.
						Understand and apply microscopic models of resistance to materials.

CHAPTER 6: DIRECT CURRENT CIRCUITS Outcomes: The student will acquire knowledge and understanding of direct current circuits.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and apply the concept of electromotive force to the battery.
						Apply resistance concepts to series and parallel circuits.
						Evaluate multi-loop circuits by Kirchoff's Laws.
						Understand the construction and application of measurement devices to resistive and capacitative circuits.
						Apply matrix methods to circuit evaluation.
						Understand and evaluate Resistive-Capacitative circuits.

CHAPTER 7: UNDERSTANDING OF MAGNETIC FIELDS Outcomes: The student will acquire knowledge and understanding of magnetic fields.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Define and apply the magnetic induction field concept.
						Apply the cross product to magnetic field applications.
						Evaluate moving charges in magnetic fields.
						Understand and apply the Hall Effect in conductors.
						Determine the force on current carrying conductors.
						Evaluate torque and magnetic fields of current carrying loops.

CHAPTER 8: MAGNETIC FIELDS Outcomes: The student will acquire knowledge and understanding of the sources of Magnetic Fields.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and apply the Biot-Savart law to determine the magnetic field.
						Define and apply the concepts of Coulombs and Amperes.
						Evaluate parallel wires, loops, infinite sheets and solenoid conductors by Ampere's Law.
						Understand and apply Gauss's Law for Magnetism.

CHAPTER 9: FARADAY'S LAW AND INDUCTION Outcomes: The student will acquire knowledge and understanding of Faraday's Law and Induction.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and apply Faraday's Law and Lenz's Law to magnetic fields.
						Evaluate induced magnetic flux and electric fields.
						Define Maxwells Equations for electromagnetic theory.

CHAPTER 10: INDUCTANCE Outcomes: The student will acquire knowledge and understanding of Inductance						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Evaluate self-inductance of parallel wires and circuits.
						Describe and evaluate induction in coils, solenoids and other circuits.
						Evaluate Inductance-Resistance and Inductance-Capacitance Circuits.

CHAPTER 11: ALTERNATING CURRENT CIRCUITS Outcomes: The student will acquire knowledge and understanding of Alternating Current Circuits						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and evaluate circuit elements of AC circuits.
						Evaluate and solve applications of RLC circuits.
						Understand and evaluate Power and Resonance in AC circuits.
						Understand and solve applications of transformers.

CHAPTER 12: ELECTROMAGNETIC WAVES Outcomes: The student will acquire knowledge and understanding of Electromagnetic Waves.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Relate the wave theory of EM radiation to Maxwells Equations.
						Understand and evaluate sinusoidal EM waves.
						Evaluate the energy transport and radiation pressure of EM radiation.
						Understand and solve applications relating to sources of EM radiation within the known spectrum.

CHAPTER 13: OPTICS Outcomes: The student will acquire knowledge and understanding of Optics.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and evaluate multiple models for light propagation.
						Define and apply reflection and refraction to problems in optics.
						Evaluate optical systems and structural materials by polarization.
						Understand and apply optical fiber concepts to problem solutions.

CHAPTER 14: GEOMETRICAL OPTICS Outcomes: The student will acquire knowledge and understanding of Geometrical Optics						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Evaluate images formed by plane and curved mirrors.
						Evaluate images formed by refracting surfaces.
						Evaluate optical systems and images formed by lenses.
						Evaluate optical system by numerical method paraxial ray tracing.

CHAPTER 15: INTERFERENCE OF LIGHT Outcomes: The student will acquire knowledge and understanding of Interference of Light						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Evaluate and solve applications of multiple source interference theory.
						Evaluate applications of thin-film interference.
						Evaluate irradiance patterns for simple interference.
						Understand optical beats and coherence theory and apply to optical systems.

CHAPTER 16: LIGHT DIFFRACTION Outcomes: The student will acquire knowledge and understanding of Light Diffraction						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Evaluate geometry for single and double slit interference.
						Evaluate systems for Young's Double slit experiment.
						Evaluate diffraction limits and resolution of optics systems.
						Evaluate the effect of slit width on systems.
						Understand and apply diffraction grating theory.
						Understand and solve basic applications of X-ray diffraction.

CHAPTER 17: THEORETICAL QUANTUM PHYSICS Outcomes: The student will acquire knowledge and understanding of Theoretical Quantum Physics						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand and evaluate black body radiation.
						Apply Planck's quantum hypothesis to physical systems.
						Determine the energies wavelengths and DeBroglie wavelengths of photons.
						Understand and apply electron diffraction and Compton Scattering to systems.
						Evaluate the line spectra of atoms.
						Understand and apply Bhor's theory of the atom.
						Define and understand the modern hydrogen Atom model.
						Evaluate the wave function for a hydrogen - like atom.
						Understand and apply the Pauli exclusion principle.

CHAPTER 18: MOLECULES AND SOLIDS Outcomes: The student will acquire knowledge and understanding of Molecules and Solids						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Understand Molecular bonds.
						Understand and utilize molecular spectra in evaluating structure.
						Have knowledge of vibrational modes of molecules.
						Understand and apply the Band Theory of conduction.
						Understand the free electron theory of conduction
						Have knowledge of the modern conduction theory.
						Understand and apply semi-conductor theory.
						Understand and apply semi-conductor theory to transistors.

Projects Required:
None

Text Book:
Contact the Bookstore for current textbook.

References:
CRC Handbook of chemistry & Physics

Materials/Equip Required:
A scientific calculator is required, a graphing calculator is recommended. Access to a computer would be helpful

Attendance Policy:
Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:
The grading policy will be outlined by the instructor in the course syllabus.

Maximum Class Size:
Based on classroom occupancy

Course Time Frame:

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time, The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

Refer to the following policies:

402.00 Academic Code of Conduct
263.00 Student Appeal of Course Grades
403.00 Student Code of Conduct

Disability Services Program:

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.