COWLEY COLLEGE
& Area Vocational Technical School

COURSE PROCEDURE FOR

INTRODUCTORY ASTRONOMY
PHS 4530 5 Credit Hours

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

Catalog Description:
PHS4530 - INTRODUCTORY ASTRONOMY (N) (5 hrs)
[KRSN PHS 1020]
Introduction to Astronomy topics include fundamental concepts (planetary, stellar, and lunar motion; gravitation; light and telescopes); solar system 1 (Earth, Moon, Mercury, Venus, and Mars); solar system 2 (Jupiter and satellites, Saturn and satellites, outer planets); stars (nature of stars, birth, evolution and death of stars, neutron stars, black holes); universe (galaxies, quasars, blazars, cosmology).

Prerequisite:
Basic computer skills, campus or personal Internet access. (Knowledge of algebra is very helpful).

Controlling Purpose:
The science of astronomy is characterized by man's ever-expanding concepts of the universe. The students study of astronomy will expand their awareness of the cosmos. The goal of this class is to give the student a feeling for the size and makeup of our universe, and a better understanding of our place in that universe.

Learner Outcomes:
Upon completion of this course, the Student will be conversant with content and methods of Modern Astronomy.

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.

UNIT I: ASTRONOMY & THE UNIVERSE

Outcomes: Upon completion of this unit, the student will gain an overview of Astronomy.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe from the context of astronomy the scale of time and space.
						Understand the value of astronomy to society and science.
						Evaluate scale from scientific notation expressions.
						Evaluate angular size and distance with the angle formula.

UNIT 2: KNOWING THE HEAVENS OUTCOMES

Outcomes: Upon completion of this unit, the student will have an understanding of positional Astronomy.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Communicate important ideas from early Egyptian, Greek and Ptolemaic astronomy.
						Describe ancient astronomical concepts.
						Relate stellar objects to constellations and names of constellations.
						Locate and follow the motions of stars on the celestial sphere.
						Relate seasonal changes in the sky to planetary and lunar motions.
						Develop a relationship between time keeping and astronomical motions.

UNIT 3:	**ECLIPSES AND THE MOTION OF MOON**					
Outcomes:	Upon completion of this unit, the student will have an understanding of the motion and behavior of the moon.					
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe lunar phases and motion.
						Describe and predict lunar eclipses.
						Describe total, partial and annular solar eclipses.
						Gain perspective for the measurement of planetary distances.

UNIT 4:	**GRAVITATION AND THE MOTIONS AND PLANETS**					
Outcomes:	Upon completion of the unit, the student will be able to use Newtonian Physics concepts to understand planetary motion and gravitation.					
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Evaluate early geocentric cosmogony in terms of planetary motion.
						Relate Copernican Heliocentric cosmogony to planetary motion.
						Describe conjunctions, oppositions and elongation of planets.
						Relate the dismantling of early cosmogonies based on observations by Tycho Brahe.
						Utilize Keplers Laws to describe planetary motions that confirmed modern astronomy.
						Relate telescopic evidence from Galileo to heliocentric cosmogony.
						Describe the confirmation of Keplers Laws of Planetary motion by Newtons Laws.
						Evaluate gravitational forces between planetary bodies.

UNIT 5:						**THE NATURE OF LIGHT AND MATTER** Outcomes: Upon completion of this unit, the student will gain an understanding of the nature of light and matter.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Relate historic processes utilized to determine characteristics of light.
						Describe the Stefan-Boltzman characterization of blackbody radiation and color temperature.
						Characterize light (particle and wave nature) by the photoelectric effect and Plancks constant.
						Understand line spectra and how they are used to evaluate the chemical makeup of stars.
						Describe the production of photons from the atomic structure of chemical elements.
						Predict wavelengths of photons from the Bohr model.
						Understand the doppler effect on light and its use in motion detection.

UNIT 6:						**OPTICS AND TELESCOPES** Outcomes: Upon completion of this unit, the student will gain an understanding of the types of telescopes and observational techniques used in modern Astronomy
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Relate the structure and function of refractive and reflective telescopes.
						Predict which type of telescope is best for an observation.
						Determine the angular resolution of a telescope.
						Describe the imaging process of CCD and spectrographic Astronomy
						Give rational for radio telescope astronomy, and advantages of orbital telescopes over the range of the electromagnetic spectrum.

UNIT 7: OUR SOLAR SYSTEM Outcomes: Upon completion of the unit, the student will gain knowledge of the solar system and modern cosmogony.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Classify planets as terrestrial or Jovian by physical characteristics. Identify the physical and chemical make-up of the planet interior.
						Understand the spectroscopic determination of planetary chemistry.
						Evaluate the relative abundance of chemicals in solar system objects.
						Describe the fundamental theories of the creation and development of the solar system.
						Recognize the significance of extra-solar objects and modern cosmogony.

UNIT 8: OUR BARREN MOON Outcomes: Upon completion of the unit, the student will understand and be able to relate lunar influence on our knowledge of the solar system.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the topology of the moon in terms of maria, major impact craters and topological terms.
						Relate the observation of the tides to gravitational forces.
						Describe the physical properties and position of the moon.
						Understand current and future exploration of the lunar surface.
						Describe dating of lunar materials and estimates of lunar age and probable creation dynamics.

UNIT 9:						**THE PLANETS** Outcomes: Upon completion of this unit the student will understand the physical and astronomical details of the planets and their moons.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the position, rotation, topology and features of the eight other planets.
						Identify the features of the planets and satellites from optical, radar, radio and spacecraft images.
						Describe the physical features of the planets and moons such as temperature, albedo, and atmosphere.
						Describe the presence of a magnetic field, ring systems or other features of interest.
						Detail the spacecraft and results of visits by spacecraft to the planets and moons.
						Indicate difficulty of ground based observation for distant planets.
						Describe other spacecraft and land based observation methods used in the study of planets.

UNIT 10:						**OTHER SOLAR SYSTEM OBJECTS** Outcomes: Upon completion of this unit, the student will have an understanding of how asteroids and comets bring information about the solar system and its origin.
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Detail the search and discovery of the asteroids.
						Relate the effects of Jovian planets on the path and motion of the asteroids.
						Define and describe asteroidal material that approaches the earth, enters the atmosphere and strikes the ground.
						Describe the physical and chemical information found in asteroid materials and the resulting implications for the early solar system.
						Describe the physical and chemical characteristics of comets, and the physical process involved as they near the sun.
						Remark on the probable creation of cometary matter.

UNIT 11: OUR STAR THE SUN Outcomes: Upon completion of this unit the student will gain an understanding of the chemical and physical characteristics of our sun.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Define the physical characteristics of the sun including the solar atmosphere and observational terminology.
						Describe sunspots and the cyclic nature of the occurrences.
						Understand and describe the thermonuclear processes that generate solar energy.
						Relate the origins of chemicals within the star from nucleosynthesis, and the bearing on the creation of planetary matter.
						Describe the theoretical implications of neutrinos and the detection of neutrinos on earth.

UNIT 12: THE NATURE OF STARS Outcomes: Upon completion of this unit, the student will gain an understanding of colors and spectra of ordinary stars and relate them to the physical characteristics of stellar evolution.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe and determine the luminosity of stellar objects and understand the parallax method of distance measure.
						Relate the magnitude scale used to evaluate brightness of objects.
						Evaluate spectral distributions according to Weins displacement law.
						Describe the characteristics of a blackbody radiator and absorber.
						Describe the spectral emission lines from atomic electron orbital concepts.
						Define spectral types and differentiate between absorption and emission spectra.
						Define spectral types with respect to absorption lines for typical stars.
						Relate luminosity of stars to class type with the Hertzsprung-Russell diagram.
						Discuss the spectroscopic studies of difficult to resolve binary stars.

UNIT 13: THE BIRTH OF STARS Outcomes: Upon completion of this unit, the student will gain an understanding of stellar evolution at locations within galaxies.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Utilize observational data and physical laws to theorize about stellar birth processes.
						Relate stellar changes in the process of stellar birth.
						Relate super novea to the birth of stars.

UNIT 14: STELLAR EVOLUTION Outcomes: Upon completion of this unit, the student will be able to rationalize the behavior of stars after the main sequence.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the core burning characteristics of Red Giant stars.
						Relate the utilization of the Einstein relation to determine lifetime of main sequence stars.
						Describe the helium burning process in Red Giants including chemical processes.
						Discuss the characteristics of cepheid, mira, and RR Lyrae variables.
						Discuss the two populations of stars, metal rich and metal poor, from the stellar spectra.

UNIT 15: DEATH OF STARS

Outcomes: Upon completion of this unit, the student will gain an understanding of the physical and chemical processes in the death of a star.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Discuss the processes in low mass star destruction resulting in nebulae and white dwarf stars.
						Discuss the physical and chemical processes in high mass star destruction resulting in supernovae and neutrino production.
						Relate the sequence of events leading to white dwarf supernovae.
						Discuss production of neutron stars and black holes.
						Discuss the ability to examine remnants of novae even after very long periods of time.

UNIT 16: NEUTRON STARS

Outcomes: Upon completion of this unit, the student will gain an understanding of the formation and physical processes of neutron stars.

A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the historical and modern theoretical concepts of neutron stars and pulsars.
						Discuss and evaluate the concept of angular momentum as it relates to stellar motion.
						Describe the physical and astronomical properties of pulsars.
						Relate the evolution of and physical properties of pulsars from binary star systems.

UNIT 17: BLACK HOLES Outcomes: Upon completion of this unit, the student will gain an understanding of the creation and evolution of black holes.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Discuss the effect of the special theory of relativity on time and motion.
						Relate time dilation and length contraction to astronomy theory.
						Discuss the physical description of a black hole.
						Discuss the probable locations of black holes in the universe.

UNIT 18: GALAXIES Outcomes: Upon completion of this unit, the student will gain an understanding of the structure, distribution and classification of galaxies.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the gradual determination of the characteristics of our Galaxy and the location of earth within it.
						Relate observations at various wavelengths of the Galaxy to structural and physical characteristics.
						Discuss the nuclear magnetic resonance effect in imaging the hidden portions of the Galaxy.
						Describe Hubbles discovery of the expanding universe and the implications in cosmology.
						Evaluate galaxies based on the Hubble classification scheme.
						Discuss the use of standard candles in distance determination.
						Utilize the Hubble Law to rationalize the expansion of the universe.
						Discuss the groupings of the galaxies and the phenomena associated with galactic collisions.
						Discuss the theories for the creation of galaxies and determine which are supported by Hubble Telescope observations.

UNIT 19: QUASARS, BLAZARS AND ACTIVE GALAXIES Outcomes: Upon completion of this unit, the student will gain an understanding of the evolution and physical properties of quasars, blazars and active galaxies.						
A	B	C	D	F	N	Specific Competencies Demonstrate the ability to:
						Describe the physical and astronomical properties of quasars.
						Discuss the evaluation of quasars from red shift.
						Describe the progression from normal galaxies to quasars via Seyfert and radio galaxies.
						Relate black holes and active galaxies.
						Discuss the unified model of active galaxies.

Projects Required:
To be determined by instructor

Text Book:
Contact the Bookstore for current textbook.

Materials/Equip:
Computer access to Internet

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 Timeframe:
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.

The learning outcomes and competencies detailed in this course meet, or exceed the learning outcomes and competencies specified by the Kansas core Outcomes Project for this course, as sanctioned by the Kansas Board of Regents.

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.