**HTC Physics Major (BS1905) Requirements and Sample Program:**

**Honors Tutorial College Requirements:**
- Must have at least 3.5 GPA overall
- Must have at least 3.5 GPA in program of study
- Tier I Freshman composition
- Tier I Junior Composition
- Freshman Honors Seminar
- Major residency: At least 50% of course work taken in the major must be completed at OU

**Physics Major (BS1905) Semester requirements:**
* Tutorials: PHYS 2970T, 2980T, 3970T, 3980T, 4970T, 4980T
* Other Physics courses: PHYS 1901, 2701, 3701, 3702, 3011, 4021, 4031, 4032
* Math Courses: MATH 2301, 2302, 3200, 3300, 3400, 3600, 4410
* Senior Honors Thesis: PHYS 4980T (taken as many times as needed)

**Sample Program**

**Freshman**

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<tr>
<td>PHYS 2970T – Tutorial</td>
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<td>MATH 2301 – Calculus 1</td>
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<td>HC 2500 – HTC Seminar</td>
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<td>PHYS 3701 – Jr Lab 1</td>
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**Senior**

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### Appendix 1 -- List of Physics Courses in Semesters:

**PHYS1901 Physics Seminar** Credit Hours: 1.0; Content: SEMINAR (1.0); Prerequisites: None; Course Description: Overview of current topics in physics, based on readings, discussion, and student presentations.

**PHYS2001 Introduction to Physics** Credit Hours: 4.0; Content: LECTURE (3.0), LABORATORY (2.0); Prerequisites: (MATH 1200 or (PL2 or higher)) & (NOT PHYS 2051); Course Description: First course in physics; open to students from all areas. Students should have a background in algebra, trigonometry and geometry, but no calculus required. Recommended for students in liberal arts, architecture, industrial technology, geological sciences, plant biology, and premedicine. Mechanics of solids and liquids, oscillations, heat, thermodynamics. No credit for 2001 after 2051.

**PHYS2002 Introduction to Physics** Credit Hours: 4.0; Content: LECTURE (3.0), LABORATORY (2.0); Prerequisites: PHYS 2001 & (NOT (PHYS 2052 or PHYS 2301) ); Course Description: Continuation of 2001. Second course in physics; open to students from all areas. Students should have a background in algebra, trigonometry and geometry, but no calculus required. Recommended for students in liberal arts, architecture, industrial technology, geological sciences, plant biology, and premedicine. Mechanics of solids and liquids oscillations, heat, and thermodynamics. Also includes electricity, magnetism, waves, sound, light, relativity, quantum, atomic, and nuclear physics.

**PHYS2051 General Physics** Credit Hours: 5.0; Content: LECTURE (3.0), RECITATION (1.0), LABORATORY (2.0); Prerequisites: MATH 2301 or concurrent; Course Description: Classical physics with calculus and vectors. Newtonian mechanics, rotational dynamics, gravitation, oscillations, fluids, thermodynamics. 3 lec, 2 lab, 1 recit.

**PHYS2051H General Physics for Physics and Astronomy Majors** Credit Hours: 5.0; Content: LECTURE (5.0); Prerequisites: MATH 2301 or concurrent; Course Description: First course in general physics for physics and astronomy majors, with emphasis on interactive learning methods. Lecture and laboratory components are combined into a single course, so students are not required to sign up for a separate lab class. Topics to be covered are: vectors and motion of objects, velocity and acceleration, forces, linear momentum, Newton's Laws, work and energy, conservation of momentum and energy, angular momentum, conservation of angular momentum, oscillations, fluids, heat and the First Law of thermodynamics, heat engines and refrigerators.

**PHYS2052 General Physics** Credit Hours: 5.0; Content: LECTURE (3.0), RECITATION (1.0), LABORATORY (2.0); Prerequisites: PHYS 2051 MATH 2301; Course Description: Classical physics with calculus and vectors. Wave mechanics and phenomena, electrostatics, capacitance, electric current and circuits, magnetism and magnetic fields, electric induction, A.C. circuits, electromagnetic waves, geometrical optics, interference, and diffraction of light.

**PHYS2052H General Physics for Physics and Astronomy Majors** Credit Hours: 5.0; Content: LECTURE (5.0); Prerequisites: (PHYS 2051H or PHYS 2051) & MATH 2301; Course Description: First course in general physics for physics and astronomy majors, with emphasis on interactive learning methods. Lecture and laboratory components are combined into a single course, so students are not required to sign up for a separate lab class. Topics to be covered are:
traveling waves, standing waves, interference of waves, optics including reflection and refraction, electric forces, electric field, electric potential, electric current, electronic circuits, magnetic field, induction, and electromagnetic waves.

**PHYS2053 Contemporary Physics: Relativity and Quantum Phenomena** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052; Course Description: Introduction to relativity and quantum theory: selected topics in atomic, solid state, nuclear, particles, and cosmology. Einstein's theory of special relativity, the uncertainty principle, Schroedinger's wave equation with applications, atomic structure, nuclear structure, elementary particles and a short introduction to cosmology.

**PHYS2301 General Physics with Biological Applications** Credit Hours: 4.0; Content: LECTURE (3.0), LABORATORY (2.0); Prerequisites: PHYS 2051 OR (PHYS 2001 & MATH 2301); Course Description: Classical physics with calculus, emphasizing biological and medical applications. Topics include fluids, waves, sound, electricity, magnetism, optics and topics in modern physics.

**PHYS2701 Electronics Laboratory** Credit Hours: 2.0; Content: LABORATORY (4.0); Prerequisites: (PHYS 2002 OR 2052 OR 2052H) & PHYSICS MAJOR; Course Description: Introduction to basic electronic circuits from analog to digital. Integrates the electronic circuit design and analysis with hands-on circuit construction. Covers DC circuit elements, transistors, FETs, op amp circuits, timers, and introduction to digital electronics.

**PHYS2930 Special Studies** Credit Hours: 1.0 - 4.0; Content: INDEPENDENT (2.0); Prerequisites: permission; Course Description: Special studies in physics under supervision of faculty member.

**PHYS2970T Physics Tutorial** Credit Hours: 1.0 - 15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: First year tutorial studies in physics.

**PHYS2980T Physics Tutorial** Credit Hours: 1.0 - 15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: First-year tutorial studies in physics.

**PHYS3001 Mechanics** Credit Hours: 4.0; Content: LECTURE (4.0); Prerequisites: PHYS 2502 & MATH 3400; Course Description: Fundamentals of physical mechanics using vector analysis and ordinary differential equations. Particle dynamics, conservative and non-conservative forces, conservation laws, accelerating reference frames and inertial forces, Lagrangian methods, central forces, celestial mechanics, many-particle systems, and rigid body dynamics.

**PHYS3011 Thermal Physics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2502 & MATH 3400; Course Description: First and Second laws of thermodynamics, phase changes, and entropy. Temperature, thermodynamic variables, equations of state, heat engine. Introduction to statistical physics: statistical interpretation of first and second laws of thermodynamics, microcanonical, canonical and grand canonical ensembles, partition functions, classical (Boltzmann) and quantum (Fermi and Bose-Einstein) statistics applied to ideal gas.

**PHYS3701 Intermediate Laboratory - Electrons & Photons** Credit Hours: 2.0; Content: LABORATORY (4.0); Prerequisites: PHYS 2053; Course Description: Fundamental
experiments on electron properties including charge and mass, wave properties, atomic binding, spin, and conduction. Experiments on photon properties involving optics and lasers.

**PHYS3702 Intermediate Laboratory - Photons & Nucleons** Credit Hours: 2.0; Content: LABORATORY (4.0); Prerequisites: PHYS 2053; Course Description: X-ray diffraction and x-ray spectroscopy. Nuclear decay modes and alpha, beta, & gamma decay spectroscopy. Nuclear reactions and scattering. Principles of operation of alpha, beta, x-ray, gamma, and neutron detectors and data acquisition systems.

**PHYS3970T Physics Tutorial** Credit Hours: 1.0 - 15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: Second-year tutorial studies in physics.

**PHYS3980T Physics Tutorial** Credit Hours: 1.0 - 15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: Second-year tutorial studies in physics.

**PHYS4021 Quantum Mechanics 1** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2053; Course Description: Short historical introduction to quantum mechanics; solutions of one-dimensional Schroedinger equation (wells, barriers, tunneling); formalism of quantum mechanics (Dirac notation, state vector, representation theory, operators, bases, measurement, uncertainty principle, Hilbert space); quantum harmonic oscillator (position representation and ladder operators); central potentials and angular momentum; bound states of central potentials (spherical square well and hydrogen atom); identical particles and spin, brief treatment of single-particle theory (Hartree approximation).

**PHYS4031 Electricity and Magnetism 1** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052 & MATH 3300 & MATH 3400; Course Description: Basic concepts of the physics of time independent electric and magnetic fields in vacuum and in matter and application of vector analysis as the adequate mathematical tool for quantitative predictions. Topics include: Vector analysis review, electrostatic fields and potentials, energy and work in electrostatics, electrostatic fields and potentials in the presence of conductors, mathematical techniques to determine electrostatic fields and potentials, electrostatic fields in matter, electric polarization and displacement, effects of magnetostatic fields on charges, generation of magnetostatic fields by steady currents, Biot Savart Law, vector potential, magnetostatic fields in matter, magnetization and magnetic susceptibility, Ferromagnetism.

**PHYS4032 Electricity and Magnetism 2** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 4031; Course Description: Basic concepts of the physics of time dependent electric fields in vacuum and in matter with intensive use of vector analysis as the adequate mathematical tool for quantitative predictions. Topics include: Electromotive force, electromagnetic induction, Maxwell’s equations, Conservation of energy and Poynting vector, conservation of momentum and Maxwell’s stress tensor, conservation of charge and equation of continuity, plane electromagnetic waves in vacuum and matter, wave guides, scalar and vector potentials, gauge transformations, retardation and Lienard-Wiechert potentials, dipole radiation, radiation by point charges, review of special relativity, relativistic notation of electrodynamics.

**PHYS 4041 Mathematical Methods in Physics 1** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 3001 & MATH 3300; Course Description: Mathematical methods, such as multivariate calculus, differential equations, series, complex analysis, and Fourier analysis, will
be discussed and applied to a variety of physics problems. The emphasis is on problem solving using these techniques, and on their unity across the discipline of physics.

**PHYS4051 Modern Physics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 3001 & PHYS 4031 & PHYS 4021 & SR.; Course Description: Designed to review and summarize the theoretical ideas of modern physics, and to examine applications to atomic spectra, nuclear and particle physics, quantum fluids and solid state physics. This is expected to be a capstone course in modern physics, so students are expected to have a solid grounding in quantum mechanics and contemporary physics.

**PHYS 4061 Geometrical and Physical Optics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052 & MATH 2302; Course Description: The behavior of light in both classical and quantum realms. Topics covered include: geometrical optics, the wave nature of light, interference, polarization, diffraction, the optical properties of materials, holography, and selected modern applications.

**PHYS 4071 Computer Simulation Methods in Physics** Credit Hours: 3.0; Content: LECTURE (2.0), LABORATORY (2.0); Prerequisites: MATH 3600 & Previous experience in programming computer languages desired.; Course Description: Introduction to numerical methods used to solve problems in physics. Students are introduced to basic numerical methods and to the process of approaching problems from a computational point of view. Topics covered include differentiation and integration methods, numerical error analysis, data fitting, matrix methods, Monte Carlo strategies.

**PHYS 4301 Cell and Molecular Biophysics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052 & CHEM 1510 & BIOS 1700; Course Description: Introduction to the physical principles that underlie phenomena in cell biology and the properties of biomolecules. Topics covered will include an introduction to molecular biology, Brownian motion, molecular interactions in macromolecules, protein and nucleic acid structure, physics of biopolymers, chemical kinetics, mechanical and adhesive properties of biomolecules, molecular manipulation techniques, cell membrane structure, membrane channels and pumps, molecular motors and biorheology.

**PHYS 4411 Electronic Device Physics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052; Course Description: Physical principles of electronic devices. Overview of electronic transport in solids with application to diodes, bipolar transistors, and field-effect transistors. Heterostructures and low-dimensional physics and devices. Selected condensed matter phenomena with electronic device applications; resonant tunneling, Landauer formalism, single-electron physics, molecular electronics, and spintronics.

**PHYS 4511 Introduction to Radiation Physics** Credit Hours: 1.0; Content: LECTURE (1.0); Prerequisites: PHYS 2002 OR PHYS 2053 ; Course Description: An introduction to radiation, natural and artificial sources of radiation for physical scientists and engineers. Topics covered include: description of natural and man-made sources of radiation; the interaction of radiation with biological systems; natural radiation background and risk assessment; exploration of radiation-based cancer treatment and medical imaging.

**PHYS 4701 Electronics Measurement Laboratory** Credit Hours:2.0; Content: LABORATORY (4.0); Prerequisites: PHYS 3702; Course Description: Experiments in
electronic measurement techniques from simple analog and digital circuits to microprocessors and analyzers. The topics to be covered include: DC circuits, capacitors, diode circuits, transistors, emitter follower, common emitter amplifier, differential amplifier, FETs, operational amplifiers, feedback, inverting amplifiers, summing amplifiers, integrators, positive feedback, frequency compensation, FET switches, voltage regulators, and digital logic.

**PHYS 4711 Advanced Laboratory** Credit Hours: 1.0 - 3.0; Content: LABORATORY (4.0); Prerequisites: PHYS 3702; Course Description: Wide selection of experiments from many areas of physics. Limit of two students per section. Student may select up to three different sections each semester.

**PHYS 4801 Acoustics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 3001 & MATH 3400; Course Description: An advanced course that deals with all aspects of modern acoustics, including advanced mathematical concepts. Vibration in solid and liquid systems, sound radiation, sound propagation, and practical aspects of sound will be discussed in detail and examined with a comprehensive sets of problems for the student that will clarify the theory and practice of acoustics.

**PHYS 4811 Dynamic Meteorology 1** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: (PHYS 3011 or PHYS 3011 taken concurrently) & MATH 3300 & MATH 3400; Course Description: Basic conservation laws, elementary fluid dynamics, circulation and vorticity. Mathematics related to coordinate systems related to meteorology, thermodynamics of the atmosphere.

**PHYS 4812 Dynamic Meteorology 2** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 4811; Course Description: Continuation of 4811. Basic conservation laws, elementary fluid dynamics, circulation and vorticity. Mathematics related to coordinate systems related to meteorology, thermodynamics of the atmosphere. Energy balance in the atmosphere, thermal physics of the atmosphere. Synoptic scale motions, atmospheric oscillations, baroclinic instabilities, mesoscale circulation, numerical methods. Special topics in dynamical meteorology.

**PHYS 4930 Special Problems** Credit Hours: 1.0-4.0; Content: INDEPENDENT (4.0); Prerequisites: 15 HRS PHYS; Course Description: Supervised research on problems of limited scope in experimental and/or theoretical physics.

**PHYS 4940H Honors Thesis** Credit Hours: 1.0-6.0; Content: RESEARCH (3.0); Prerequisites: HTC OR DEPT HONORS CANDIDACY; Course Description: Supervised research work in physics, astronomy, or applied physics, intended for submission for undergraduate honors.

**PHYS 4942 Undergraduate Seminar** Credit Hours: 1.0; Content: SEMINAR (1.0); Prerequisites: JR OR SR; Course Description: Important areas of current interest in field of physics, history of physics, development of ideas in physics, and other aspects of physics.

**PHYS 4970T Physics Tutorial** Credit Hours: 1.0-15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: Third- and fourth-year tutorial studies in physics.

**PHYS 4980T HTC Thesis Research** Credit Hours: 1.0-15.0; Content: TUTORIAL (2.0); Prerequisites: HTC; Course Description: HTC Thesis research
Appendix 4 – Astronomy courses

**ASTR 1000 Survey of Astronomy** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: ; Course Description: General introduction to astronomy, with emphasis on the structure of the universe beyond our solar system. Topics include historical astronomy, the sun, stars, galaxies, interstellar matter, black holes, the "Big Bang" theory, and the evolution of the universe. No prereq, but familiarity with basic algebra and geometry is beneficial.

**ASTR 1001 Moons and Planets** The Solar System Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: ; Course Description: General introduction to astronomy, with emphasis on our solar system and other planetary systems. Topics (chosen by instructor) may include historical astronomy, the sun, the surfaces, interiors, and atmospheres of the planets, comets, asteroids, and meteor impacts, planets around other stars, and the origin of life. Also listed as PSC 1001. No prerequisites, but familiarity with basic algebra and geometry is beneficial.

**ASTR 1400 Observational Astronomy** Laboratory Credit Hours: 1.0; Content: LABORATORY (2.0); Prerequisites: ; Course Description: Experience with telescopes and locating stars, planets, and deep sky objects in the night sky. Also covers major constellations, seasonal variations, lunar cycles, and, when appropriate, eclipses and comets.

**ASTR 3251 Fundamentals of Astrophysics** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: PHYS 2052 and MATH 3300. Some experience with computer programming is recommended.; Course Description: Physical foundations of astronomical observation and theory. Specific topics include time and coordinate systems, orbits, celestial mechanics, radiation mechanisms, spectra, telescopes, and instrumentation. In addition, an introduction to the physical properties of stars, galaxies, and interstellar matter and an overview of cosmological distance measurements and the "hot big bang" model will be covered, along with an introduction to astronomical data analysis.

**ASTR 3940 Astronomy Laboratory** Credit Hours: 1.0 - 3.0; Content: RESEARCH (1.0); Prerequisites: (ASTR 3251) OR (instructor's permission); Course Description: Telescope observations and other laboratory studies dealing with astronomy.

**ASTR 4201 Stellar Astrophysics and Radiation** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: ASTR 3251 & MATH 3400; Course Description: Introduction to radiative transfer, including radiation mechanisms, and formation of spectral lines; discusses the physics of the cold interstellar medium and its relationship to star formation; and provides an overview of stellar evolution and stellar remnants, including white dwarfs, supernovae, and neutron stars.

**ASTR 4202 Interstellar Medium and Galaxies** Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: ASTR 3251 & MATH 3400; Course Description: Analysis of the physics of the warm and hot interstellar medium, including photoionization, thermal equilibrium, and shocks; overview of the structure and dynamics of the Milky Way and other galaxies; discussion of Galaxy formation and evolution, and their relationship to galaxy clusters and large-scale structure; introduction to the physics of active galactic nuclei.
ASTR 4271 Observational Astrophysics Credit Hours: 3.0; Content: LECTURE (2.0), INDEPENDENT (1.0); Prerequisites: ASTR 3251; Course Description: Provides a high-level introduction to modern observational techniques and instrumentation. Topics covered include use of CCDs for optical observations; factors determining measurement signal-to-noise ratio; detection and measurement methods for optical imaging of astronomical sources; factors determining experimental design; and special considerations for radio and space-based observations. During the course of the semester students carry out an observational project, including project conception, data acquisition and analysis, and presentation of results.

ASTR 4930 Studies in Astronomy Credit Hours: 1.0-6.0; Content: INDEPENDENT (1.0); Prerequisites: ASTR 3251, instructor's permission; Course Description: Special studies in Astronomy under the supervision of a faculty member.
Appendix 5 – Math courses

MATH 1200 College Algebra Credit Hours: 4.0; Content: LECTURE (4.0); Prerequisites: C OR T OR BETTER IN MATH 0005 Intermediate Algebra OR MATH PLACEMENT LEVEL 1 OR HIGHER; Course Description: Topics in algebra including functions, linear equations and systems, polynomials, rational and radical expressions, quadratic equations, exponential and logarithmic functions, and inequalities. This course is primarily intended to prepare students for Business Calculus. Students needing Tier I Math credit only should consider Intro Game Theory instead. Those whose program requires MATH 2301 Calculus I should start with PreCalculus.

MATH 1300 Pre-Calculus Credit Hours: 4.0; Content: LECTURE (4.0); Prerequisites: Placement Level 2 or (C or T or better) in 1200 College Algebra; Course Description: Graphs, inverses, and operations of functions. Study of polynomial, rational, exponential, logarithmic, and trigonometric functions. Additional topics from trigonometry and analytic geometry. Recommended only for students intending to enroll in MATH 2301 Calculus I.

MATH 2301 Calculus I Credit Hours: 4.0; Content: LECTURE (3.0), RECITATION (1.0); Prerequisites: (Placement Level 3) or (C or T or better in MATH 1300 or MATH 1322) or (B or better in MATH 1350); Course Description: First course in calculus and analytic geometry with applications in the sciences and engineering. Includes basic techniques of differentiation and integration with applications including rates of change, optimization problems, and curve sketching; includes exponential, logarithmic and trigonometric functions. No credit for both MATH 2301 and 1350.

MATH 2302 Calculus II Credit Hours: 4.0; Content: LECTURE (3.0), RECITATION (1.0); Prerequisites: C or T or better in 2301 Calculus I; Course Description: Second course in calculus and analytic geometry with applications in the sciences and engineering. Includes techniques of integration, conic sections, polar coordinates, infinite series, vectors and vector operations.

MATH 2500 Introduction to Statistics Credit Hours: 4.0; Content: LECTURE (4.0); Prerequisites: MATH 1200 or MATH 1321 or PLACEMENT LEVEL 2 OR HIGHER and (NOT PSY 1100 OR 2110 OR ISE 3040); Course Description: An introductory course in applied statistics. Organization of data, central tendency and dispersion, probability, concept of random variables, probability distributions, estimation, testing hypotheses, linear regression and correlation, analysis of variance, and use of Excel in statistical analysis.

MATH 3200 Applied Linear Algebra Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: 2301 or 1350; Course Description: A course on linear algebra with an emphasis on applications and computations. Solutions to linear systems, matrices and matrix algebra, determinants, n-dimensional real vector spaces and subspaces, bases and dimension, eigenvalues and eigenvectors, diagonalization, norms, inner product spaces, orthogonality and least squares problems.

MATH 3300 Calculus III Credit Hours: 4.0; Content: LECTURE (3.0), RECITATION (1.0); Prerequisites: C OR T OR BETTER in MATH 2302; Course Description: Third course in calculus and analytic geometry with applications in the sciences and engineering. Includes partial differentiation, multiple integrals, line and surface integrals, and the integral theorems of vector calculus.
MATH 3320 Vector Analysis  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: MATH 3300 Calculus III; Course Description: Vector algebra and its applications. Vector calculus and space curves. Scalar and vector fields, gradient, divergence, curl, and Laplacian. Line and surface integrals. Divergence theorem. Stoke's theorem, and Green's theorem.

MATH 3400 Elementary Differential Equations  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: C OR T OR BETTER in MATH 2302 Calculus II; Course Description: Introduction to ordinary differential equations and their use as models for applications with an emphasis on exact solution methods for linear equations and systems including Laplace transform methods.

MATH 3500 Probability  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: 2302 and (3050 or CS 3000); Course Description: A mathematical introduction to univariate probability theory with some applications, particularly to statistics. Topics will include the basic rules of probability, conditional probability, independent events, the Law of total probability, Bayes' Theorem, univariate random variables, discrete and continuous distributions and the density function, expectation, variance, higher moments, and special discrete and continuous distributions such as Bernoulli, binomial, Poisson, uniform, exponential, gamma and normal.

MATH 3600 Applied Numerical Methods  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: MATH 3400 Differential Equations; Course Description: A survey of numerical methods for engineering, science and mathematics students. Topics include: solutions of systems of linear and nonlinear equations, eigenvalues, numerical differentiation and integration, and numerical solution of ordinary and partial differential equations. The topics will be posed in a setting of problems intended for engineering students using MATLAB. The course will simultaneously introduce numerical methods, programming techniques, problem solving skills and the Matlab language, in a lecture-lab format.

MATH 4310 Complex Variables  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: 3300; Course Description: A first course in complex variables focused on developing analytic techniques that are useful in applications. The course is also essential for further study in mathematics and students will be expected to do some proofs. Topics will include: Analytic and harmonic functions, Cauchy integration and residue theorems, contour integration, Taylor and Laurent expansions, conformality and linear fractional transformations with applications.

MATH 4330 Hilbert Spaces and Applications  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: 3400 , (3200 or 3210); Course Description: A course in applied linear analysis, especially Hilbert spaces, for advanced undergraduate and graduate students in mathematics, the sciences or engineering. The course will introduce both the practical and theoretical aspects of linear analysis and students will be expected to complete both computational and proof-oriented exercises. Topic covered will include: Normed Vector Spaces, the spaces L1 and L2, Hilbert Spaces, orthonormal systems, linear operators on Hilbert space and applications to differential equations.

MATH 4400 Advanced Differential Equations  Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: 3400, (3200 or 3210); Course Description: An introduction to the qualitative theory of differential equations, with emphasis on linear systems.
MATH 4410 Fourier Analysis and Partial Differential Equations Credit Hours: 3.0; Content: LECTURE (3.0); Prerequisites: MATH 3300 Calc III & 3400 Differential Equations; Course Description: Representation of functions as sums of infinite series of trigonometric functions and complex exponentials, Bessel functions, Legendre polynomials, or other sets of orthogonal functions. Use of such representations for solution of partial differential equations dealing with vibrations, heat flow, and other physical problems.