

Engineering Physics (ENGP)

ENGP 501 Numerical Methods for Engineers and Scientists 3 Credits (3,0)

Numerical solutions for engineering physics problems; linear equations, ODEs, PDEs, finite difference methods, MATLAB programming. Applications in diffusion, plasma waves, and remote sensing.

Course Offered at: Daytona Beach

ENGP 505 Spacecraft Dynamics and Control 3 Credits (3,0)

Dynamic systems modeling and analysis; classical and modern control techniques; orbital dynamics and maneuvers; attitude sensors and control techniques; passive control (spin, dual-spin, gravity-gradient, magnetic stabilization); active control (thrusters, momentum wheels, reaction wheels, control moment gyros); optimal control application to spacecraft maneuvers.

Course Offered at: Daytona Beach

ENGP 507 Astrophysics I 3 Credits (3,0)

Examines stellar structure, evolution, interstellar medium, galaxies, and cosmology. Emphasizes astrophysical processes common to astronomical systems.

Course Offered at: Daytona Beach

ENGP 508 Astrophysics II 3 Credits (3,0)

Galactic structure and evolution, cosmology, expanding universe. Study of astrophysical processes in galactic and extragalactic environments.

Course Offered at: Daytona Beach

ENGP 510 Space Physics 3 Credits (3,0)

Structure of the neutral and ionized atmosphere, solar electromagnetic radiation, photoionization, ionosphere and magnetosphere, solar disturbances, satellite orbit decay, long-distance communication, composition, thermodynamics, and processes of near-Earth space.

Course Offered at: Daytona Beach

ENGP 511 Advanced Space Physics 3 Credits (3,0)

Advanced plasma physics applied to space environments, including solar wind, planetary magnetospheres, auroral dynamics, space radiation, and space weather. Satellite mission studies.

Course Offered at: Daytona Beach

ENGP 520 Advanced Planetary Sciences 3 Credits (3,0)

Study of the planetary system's origin, evolution, and current state. Dynamics, interiors, atmospheres, and magnetospheres of planets and their satellites, asteroids, and comets.

Course Offered at: Daytona Beach

ENGP 523 Engineering Electricity and Magnetism 3 Credits (3,0)

Solutions of electrostatic and magnetic problems using Poisson's and Laplace's equations, electromagnetic induction, Maxwell's equations, reflection, refraction, waveguides, antenna radiation.

Course Offered at: Daytona Beach

ENGP 525 Observational Astronomy 3 Credits (3,0)

Telescope design and use; astronomical optics; optical filters, adaptive optics, calibration, and tracking accuracy. Imaging techniques for the sun, moon, planets, and stars.

Course Offered at: Daytona Beach

ENGP 532 Applied Quantum Mechanics 3 Credits (3,0)

Selected topics and applications from Schrodinger equation, harmonic oscillator, hydrogen atom, operators, angular momentum, spin, time-dependent and independent perturbation theory, scattering theory, quantum statistical distributions.

Course Offered at: Daytona Beach

ENGP 599 Special Topics in Engineering Physics 1-6 Credit (1-6,0)

Individual, independent, or directed studies of selected topics in engineering physics.

Course Offered at: Daytona Beach, Prescott

ENGP 601 Experimental Methods in Space Science 3 Credits (3,0)

Ground-based, rocket, and satellite measurement techniques; atmospheric composition, charged particle detection, optical remote sensing, imaging. Quantitative development of advantages and limitations.

Course Offered at: Daytona Beach

ENGP 605 Spacecraft Power and Thermal Design 3 Credits (3,0)

Spacecraft power systems and thermal energy management. Energy storage, power subsystem design, heat transfer modes, spacecraft thermal analysis, active and passive thermal control.

Course Offered at: Daytona Beach

ENGP 699 Special Topics in Engineering Physics 1-6 Credit (1-6,0)

Individual, independent, or directed studies of selected topics in engineering physics.

Course Offered at: Daytona Beach, Prescott

ENGP 700 Graduate Thesis 1-9 Credit (1-9,0)

A master-level research project in Space Science/Engineering Physics including an oral thesis defense and a written report satisfying all graduate school guidelines. The work is supervised by the student's advisor and thesis committee. The approval of the thesis committee is required to receive final thesis credit.

Course Offered at: Daytona Beach

ENGP 701 Analytical Techniques in Engineering Physics 3 Credits (3,0)

Mathematical techniques for engineering physics problems: Fourier and wavelet analysis, Legendre polynomials, rotation groups, and applications to space science and spacecraft engineering.

Course Offered at: Daytona Beach

ENGP 702 Theoretical Mechanics and Astrodynamics 3 Credits (3,0)

Lagrangian and Hamiltonian dynamics, variational methods, canonical transformations, Keplerian motion, patched-conic orbits, perturbation methods, planetary equations, space navigation.

Course Offered at: Daytona Beach

ENGP 703 Electrodynamics of Space

Environment 3 Credits (3,0)

Electromagnetic fields in space; electrostatics, magnetostatics, electrodynamics. Solutions to electromagnetic problems in space plasma, antennas, and scattering using Maxwell's equations.

Course Offered at: Daytona Beach

ENGP 704 Stochastic Systems in Engineering

Physics 3 Credits (3,0)

Stochastic processes and their applications in engineering and physics. Gaussian processes, Markov processes, stochastic differential equations, Kalman filtering, time-series analysis.

Course Offered at: Daytona Beach

ENGP 705 Optimal Dynamical Systems 3 Credits (3,0)

Optimal control systems: calculus of variations, LQR and LQG methods, Pontryagin maximum principle, time-optimal control. Focus on recent research in dynamical systems and control.

Course Offered at: Daytona Beach

ENGP 706 Electro-Optical Engineering 3 Credits (3,0)

Fiber-optics communication systems; lasers, optical amplifiers, detectors, remote sensing systems such as LIDAR, hyper-spectral imaging, and infrared cameras. Applications in industrial and space exploration.

Course Offered at: Daytona Beach

ENGP 707 Nonlinear Dynamical Control

Systems 3 Credits (3,0)

Advanced nonlinear control methods: geometric nonlinear control, feedback linearization, advanced stability analysis. Includes research on recent trends in nonlinear dynamical systems.

Course Offered at: Daytona Beach

ENGP 708 Remote Sensing: Active and Passive 3 Credits (3,0)

Fundamentals of radar and passive remote sensing. Analytical techniques, system design, and applications of radiometers and radar to environmental monitoring. System engineering tradeoffs and calculations.

Course Offered at: Daytona Beach

ENGP 709 Upper Atmospheric Physics 3 Credits (3,0)

Structure, composition, and dynamics of the upper atmosphere. Solar radiation, photochemistry, thermodynamics, auroras, airglow, noctilucent clouds, energy balance, and global change.

Course Offered at: Daytona Beach

ENGP 710 Space Plasma Physics 3 Credits (3,0)

Advanced plasma physics and space applications. Vlasov theory, magnetohydrodynamics, waves, instabilities, and applications in the space environment.

Course Offered at: Daytona Beach

ENGP 711 Computational Atmospheric

Dynamics 3 Credits (3,0)

Numerical solution of atmospheric fluid dynamics. Comparisons between simulations and real observations, hands-on project with large-scale simulations, fluid flow equations.

Course Offered at: Daytona Beach

ENGP 712 Geophysical Fluid Dynamics 3 Credits (3,0)

Atmospheric and oceanic fluid dynamics. Wave motions, Rossby waves, Kelvin waves, turbulence, global-scale winds, and energy dissipation in rarefied gases.

Course Offered at: Daytona Beach

ENGP 799 Special Topics in Engineering

Physics 1-6 Credit (1-6,0)

Individual, independent, or directed studies of selected topics in engineering physics.

Course Offered at: Daytona Beach, Prescott

ENGP 800 Dissertation 1-9 Credit (1-9,0)

Doctoral-level research in Engineering Physics. Oral defense and written dissertation meeting doctoral program guidelines. Supervised by advisor and dissertation committee. Dissertation committee approval required for final credit.

Course Offered at: Daytona Beach