ENGINEERING PHYSICS (E P)

E P 271 – ENGINEERING PROBLEM SOLVING I
3 credits.

Solution of engineering problems using commercially-available software tools (spreadsheets, symbolic manipulators, and equation solvers). The emphasis will be on nuclear engineering problems, including radioactive decay, nuclear cross sections, scattering, and criticality.
Requisites: (MATH 222 or 276) and (E M A 201, PHYSICS 201, 207, 247, or concurrent enrollment) or member of Engineering Guest Students
Repeatable for Credit: No
Last Taught: Fall 2023

E P 272 – ENGINEERING PROBLEM SOLVING USING MAPLE
1 credit.

An introduction to multi-step engineering problem solving using Maple (symbolic mathematics) software.
Requisites: MATH 222 or 276, or member of Engineering Guest Students
Repeatable for Credit: No

E P 418 – SUSTAINABLE ENERGY CHALLENGES AND SOLUTIONS
1 credit.

Interdisciplinary survey of energy research topics. Understand how sustainable energy challenges are being studied and solved by different disciplines, from science and engineering to social sciences and humanities. Analyze energy sustainability using a multi-disciplinary, systems-based approach.
Requisites: Declared in the Certificate in Engineering for Energy Sustainability or Engineering: Sustainable Systems Engineering, MEng
Repeatable for Credit: No
Last Taught: Spring 2024

E P 468 – INTRODUCTION TO ENGINEERING RESEARCH
1 credit.

An introduction to the conduct of engineering research: the scientific method, ethics in research, documentation and treatment of research data, publication practices, and the structure of the broader research community are covered.
Requisites: Declared in Engineering Physics
Course Designation: Honors - Accelerated Honors (!)
Repeatable for Credit: No
Last Taught: Fall 2023

E P 469 – RESEARCH PROPOSAL IN ENGINEERING PHYSICS
1 credit.

An introduction to current research topics in engineering physics. Development of an undergraduate research proposal supervised by faculty members.
Requisites: E P 468 and declared in Engineering Physics
Course Designation: Honors - Accelerated Honors (!)
Repeatable for Credit: No
Last Taught: Spring 2024

E P/E M A 471 – INTERMEDIATE PROBLEM SOLVING FOR ENGINEERS
3 credits.

Use of computational tools for the solution of problems encountered in engineering physics applications. Topics covered include orbital mechanics, structural vibrations, beam and plate deformations, heat transfer, neutron diffusion, and criticality. Emphasis will be on modeling, choice of appropriate algorithms, and model validation.
Requisites: (MATH 319, 320 or 375) and (E P 271 or COMP SCI 310), or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2024

E P/E M A 476 – INTRODUCTION TO SCIENTIFIC COMPUTING FOR ENGINEERING PHYSICS
3 credits.

Background for professional numerical computation in Linux environments begins with shell scripting and software archiving. Programming skills in a compiled language are then developed through scientific and engineering examples. Engineering problem-solving skills are reinforced through applications that require numerical solutions to systems of differential and/or integral equations, while motivating progressively more advanced computational methods.
Requisites: (E P 271, COMP SCI 300, or 310) and (MATH 319, 320, or 375), or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2022

E P/E M A 547 – ENGINEERING ANALYSIS I
3 credits.

Methods of higher mathematics; stress on problem solving rather than rigorous proofs; linear algebra, calculus of variations, Green's function.
Requisites: MATH 321, or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2023

E P/E M A 548 – ENGINEERING ANALYSIS II
3 credits.

Function of complex variable, series solution of differential equations, partial differential equations. A year of math beyond calculus
Requisites: (MATH 322 and 320), (MATH 322 and E P/E M A 547), or (MATH 322, 319, and 340), or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2024

E P/M E 566 – CRYOGENICS
3 credits.

Applications of cryogenics, material properties at low temperatures, refrigeration and liquefaction systems, measurement techniques, insulation, storage and transfer of cryogenics, safety and handling.
Requisites: (M E 361 or PHYSICS 415) and (CBE 320 or M E 364), or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

E P 568 – RESEARCH PRACTICUM IN ENGINEERING PHYSICS I
3 credits.

Undergraduate research projects supervised by faculty members.
Requisites: E P 469 and declared in Engineering Physics
Course Designation: Honors - Accelerated Honors (!)
Repeatable for Credit: No
Last Taught: Fall 2023

E P 569 – RESEARCH PRACTICUM IN ENGINEERING PHYSICS II
3 credits.

Undergraduate research projects supervised by faculty members. Senior thesis.
Requisites: E P 568 and declared in Engineering Physics
Course Designation: Honors - Accelerated Honors (!)
Repeatable for Credit: No
Last Taught: Spring 2024

E P 602 – SPECIAL TOPICS IN ENGINEERING PHYSICS
1-3 credits.

Subject matter, credits and prerequisites vary.
Requisites: None
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2022

E P/E M A 615 – MICRO- AND NANOSCALE MECHANICS
3 credits.

An introduction to micro- and nanoscale science and engineering with a focus on the role of mechanics. A variety of micro- and nanoscale phenomena and applications covered, drawing connections to both established and new mechanics approaches.
Requisites: Graduate/professional standing or E M A 303 or M E 306
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

E P/COMP SCI/E C E/E M A/M E 759 – HIGH PERFORMANCE COMPUTING FOR APPLICATIONS IN ENGINEERING
3 credits.

An overview of hardware and software solutions that enable the use of advanced computing in tackling computationally intensive Engineering problems. Hands-on learning promoted through programming assignments that leverage emerging hardware architectures and use parallel computing programming languages. Students are strongly encourage to have completed COMP SCI 367 or COMP SCI 400 or to have equivalent experience.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2023

E P/M E 777 – VACUUM TECHNOLOGY
3 credits.

Topics defining modern vacuum technology, including the kinetic theory of gases, conductance, pumping systems, pump technologies, pressure measurement, gas-surface interactions, sealing technologies, leak detection, and residual gas analysis will be addressed through a combination of lectures, laboratory activities, problem solving, and group discussions. Knowledge of fluid mechanics [such as M E 363 or B M E 320] strongly encouraged.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

E P 920 – ENGINEERING PHYSICS GRADUATE SEMINAR
0-1 credits.

Students will be able to enroll for credit more than once because the topics of the course will differ substantially from semester to semester. Our MS requirements permit up to 3 credits within the 30-credit minimum for the degree.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2024