ESM 335 Strength of Materials
The mechanical behavior of materials, assuming a basic knowledge of elasticity, plasticity, fracture and creep. Provides topics across all scales. Continuum mechanics, advanced phenomena in mechanics of materials, and case studies and measurement techniques.
Prerequisite: AMS 201 or MAT 220; ESG 302
4 credits

ESM 336 Electronic Materials
The properties of intrinsic and extrinsic semiconductors are discussed with particular attention first to the equilibrium distribution of electrons in the bands and then to the nonequilibrium transport of charge carriers. The properties and applications of photoconductors and of luminescent materials are then described. The concept of stimulated emission is introduced, laser operation explained, and laser materials discussed in relation to their applications in science and technology. Other topics considered are the properties of magnetic materials, of dielectric materials, and of superconductors.
Prerequisite: ESG 333
3 credits

ESM 350 Advanced Engineering Laboratory
Students work in teams to perform advanced laboratory projects that emphasize the structure-property relationship. Emphasis is placed on analysis, multivariate fitting of data, and technical manuscript preparation.
Prerequisite: ESG 312
Pre-or Corequisite: ESG 333
3 credits

ESM 353 Biomaterials: Manufacture, Properties, and Applications
The engineering characteristics of materials, including metals, ceramics, polymers, composites, coatings, and adhesives, that are used in the human body. Emphasizes the need of materials that are considered for implants to meet the material requirements specified for the device application (e.g., strength, modulus, fatigue and corrosion resistance, conductivity) and to be compatible with the biological environment (e.g., nontoxic, noncarcinogenic, resistant to blood clotting if in the cardiovascular system).
Prerequisite: ESG 332
3 credits

ESM 355 Materials and Processes in Manufacturing Design
The design of mechanical and electrical systems, materials selection, and fabrication processes are surveyed and shown to be essential components of manufacturing engineering. The mechanical and thermal processing of a wide range of metallic and nonmetallic materials is reviewed. Modern computer-based material selection, advanced processing methods, and automation are explored.
Prerequisite: ESG 332 or 333
3 credits

ESM 369 Polymer Engineering
An introductory survey of the physics, chemistry and engineering processes of polymers. Topics covered include classification of polymers, structures of polymers, morphology of polymers, thermodynamics of polymers, phase separation and phase transition of polymers, crystallization of polymers. Case studies of commercial polymer production and processing.
Prerequisite: ESG 332
3 credits

ESM 378 Materials Chemistry
Our high-technology world is driven forward by advances in materials chemistry. This class will discuss some of the materials that underpin these technologies, as well as some of the novel classes of materials that are being developed for future applications. The course will cover the synthesis, structures, and properties of advanced materials, focusing on a range of topics with current societal importance (e.g. energy, computers, nanoscience, etc.). Specific topics may include batteries, fuel cells, catalysts, metals, semiconductors, superconductors, magnetism, and polymers.
Prerequisite: CHE 375 or Permission of the instructor
3 credits

ESM 400 Research and Nanotechnology
This is the capstone course for the minor in Nanotechnology Studies (NTS). Students learn primary aspects of the professional research enterprise through writing a journal-quality manuscript and making professional presentations on their independent research (499) projects in a formal symposium setting. Students will also learn how to construct a grant proposal (a typical NSF graduate fellowship proposal), methods to search for research/fellowship funding, and key factors in being a research mentor.
Prerequisite: ESM 213; at least one semester of independent research (499 course)
3 credits

ESM 450 Engineering Systems Laboratory
A systems approach will be taken to understand the fundamental properties of materials and their implications on engineering design and applications. The advanced gas turbine engine is used as the main test-bed for this laboratory class. Results from mechanical testing and phase analysis will be analyzed in the context of real-world system construction, operation and reliability.
Prerequisite: ESG 332
3 credits

ESM 475 Undergraduate Teaching Practicum
May be used as an open elective only and repeated once.
Prerequisite: U4 standing as an undergraduate major within the college; a minimum g.p.a. of 3.00 in all Stony Brook courses and the grade of B or better in the course in which the student is to assist; permission of department
3 credits

ESM 488 Cooperative Industrial Practice
A design engineering course oriented toward both research/development and manufacturing technology. Students will work in actual industrial programs carried out cooperatively with companies established as university incubators or with regionally located organizations. Supervised by a committee of faculty and industry representatives to which students report.
Prerequisite: Permission of department
0-3 credits

ESM 499 Research in Materials Science
An independent research project with faculty supervision. Permission to register requires a B average in all engineering courses and the agreement of a faculty member to supervise the research. May be repeated, but only three credits of research electives (AMS 487, BME 499, CSE 487, ESE 499, ESM 499, ESG 499, EST 499, ISE 487, MEC 499) may be counted toward technical elective requirements. Prerequisite: B average in all engineering courses and the agreement of a faculty member to supervise the research
0-4 credits