COURSE DESCRIPTIONS

ESM

Materials Science

ESM 221 Introduction to Chemistry of Solids
Introduction to the synthesis, structure, properties, and applications of solid materials. Topics include preparation and characterization of solids (introduction to X-ray diffraction), thermal decomposition, crystall structure, crystal defects, and solid-state properties that influence chemical reactivity. This course is offered as both CHE 221 and ESM 221. Prerequisites: CHE 132 or 142 or 198, and CHE 133 or ESM 334; AMS 261 or MAT 203; ESG 332

ESM 299 Directed Research in Materials Science
A directed research project with faculty supervision or as part of a research team. Intended for freshman or sophomore students to develop research skills in a closely mentored environment. A final report and oral presentation are required at the end of the project. ESM 199 is a recommended prerequisite. Prerequisite: Permission of the Undergraduate Program Director

ESM 302 Introduction to the Crystalline State
A laboratory/lecture course introducing the concept that crystallography is based on a few easily understood ideas. These provide a working knowledge of crystal geometry and the ability to interpret X-ray powder photographs and electron diffraction patterns. Includes structures and lattices, planes and directions, crystal geometry, atomic coordinates, stereographic projections, X-ray Laue photographs, the reciprocal lattice, and electron diffraction. Prerequisites: CHE/ESM 221; ESG 332

ESM 309 Thermodynamics of Solids
The application of thermodynamics to analysis of phase equilibria and reactions in solids. Topics include ideal and real solutions; phase equilibrium diagrams; first- and higher-order phase transitions; and thermodynamics of diffusion, oxidation, and corrosion reactions. Prerequisite: MEC 303 or ESG 302

ESM 325 Diffraction Techniques and Structure of Solids
X-ray diffraction techniques are emphasized. Topics include coherent and incoherent scattering of radiation, structure of crystalline and amorphous solids, stereographic projection, and crystal orientation determination. The concept of reciprocal space is introduced early in the course and is used as a means of interpreting diffraction patterns. Laboratory work in X-ray diffraction patterns is also included to illustrate the methods. Prerequisite: ESG 332

ESM 334 Materials Engineering
Practical application of basic material and engineering concepts to fundamental and advanced material utilization. To that end, the course is divided into three sections: (1) “Tough stuff,” (2) “Hot stuff,” and (3) “Smart stuff.” Combined, these address issues of material operation and failure under normal and harsh conditions, high-temperature electrochemical devices (e.g., solid oxide fuel cells), thermal barrier systems, electro-magnetic devices and shape memory alloys. Prerequisite: ESG 332

ESM 335 Strength of Materials
The mechanical behavior of materials, assuming a basic knowledge of elasticity, plasticity, fracture, and creep. Provides topics treatment of these topics across size scales. Continuum mechanics, advanced phenomena in mechanics of materials, and case studies and measurement techniques. Prerequisites: ESM 334; AMS 261 or MAT 203; ESG 302

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

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

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 manufacture 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). This course is offered as both ESM 353 and BME 353. Prerequisite: ESG 332

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 modern manufacturing. The mechanical and thermal processing of a wide range of metallic and nonmetallic materials is reviewed. Modern computer-based materials selection, advanced processing methods, and automation are explored. Prerequisite: ESG 332 or 333

ESM 369 Polymers
An introductory survey of the physics, chemistry, and technology of polymers. Topics covered include classification of polymers, molecular forces and bonds, structure of polymers, measurement of molecular weight and size, rheology and mechanical properties, thermodynamics of crystallization, polymerization mechanisms, and commercial polymer production and processing. Prerequisite: ESG 332

ESM 450 Phase Changes and Mechanical Properties of Materials
A laboratory course. Phase diagrams and microstructural changes in solids are investigated by thermal experiments. Other experiments demonstrate the mechanical properties of ductile and brittle materials. Prerequisite: ESG 332

ESM 475 Undergraduate Teaching Practicum
May be used as an open elective only and repeated once. Prerequisites: 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

ESM 488 Cooperative Industrial Practice
A design engineering course oriented toward both research/development and manufacturing technology. Students 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

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, CHE 497, ESE 498, ESM 499, EST 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

EST

Technology and Systems Management

EST 100 Computer Literacy in a Digital Era
Introduces computer applications and selection of computer-based tools and the skills necessary to be successful in an era of digital revolution including: electronic communication; application-based projects; information management and assessment; and the societal impacts of digital literacy. Emphasizes computer literacy skills used in education, industry, and other professional environments. Participation in weekly computer labs is required.

EST 102-E Weather and Climate
Introduces the nature and causes of common meteorological phenomena, severe weather occurrences, and climatic patterns. Topics include formation and movement of air masses and large-scale storms; techniques for weather prediction; weather satellites; hurricanes, tornadoes, and thunderstorms; cloud and precipitation types; the climatic history of the earth; and actual and potential effect of human activities on weather and climate, and of weather and climate on humans. This course is offered as both ATM 102 and EST 102.

EST 104 Projects in Technology and Society
Introduces students to technological issues in society. A new topic is presented each semester. Explores underlying scientific and engineering concepts, ethical issues, and technological risks. Students complete a project with faculty supervision. Prerequisite: Permission of department

EST 192 Introduction to Modern Engineering
Familiarizes students with systems and decision-making concepts of modern engineering and technology.
The Conceptual areas to be studied include an engineering approach to problem solving and design, modeling of dynamic systems, and technology assessment. The artificial heart program, solar energy technology, and building access for the handicapped are some of the socio-technological case studies that are used.

**EST 194-C Patterns of Problem Solving**
A survey of techniques and methods of problem solving as developed by the engineer and applied scientist. Applications drawn from a broad range of fields, intended for non-engineering majors.
Prerequisite: Satisfaction of entry skill in mathematics
3 credits

**EST 201-H Technological Trends in Society**
Explores the impact of technology and engineering design on society past, present, and future. The main themes as they relate to changing technology are: industry and the economy; the environment; social, educational, and psychological implications of computers; energy and society; warfare; and 21st-century emerging technologies.
Prerequisite: One D.E.C. category E course
3 credits

**EST 210 Learning to Learn New Technologies**
Developing processes for learning new technology that continues to change at an increasing rate. The key issues covered are: learning new software tools, the problem of Prag, process; applying tools, debugging; choosing a tool, helping others to learn new software packages; how networks change the use of tools, ethical issues, Internet, and the information explosion. Classes are held in computer laboratories. Students are required to work in campus computer consulting situations.
3 credits

**EST 291-H Energy, Environment, and People**
Case studies selected from topics such as radioactive wastes; Long Island’s toxic wastes; Shoreham, Chernobyl, and nuclear safety; agriculture and the environment; and global resources. The course emphasizes the interplay between scientific and engineering considerations and human values and institutions.
Prerequisites: Two D.E.C. category E courses (except those designated ANP); any AMS or MAT course
3 credits

**EST 300 Computer Modeling and Experiments in Mathematics and Science Education**
Focus on computer-based experimentation and modeling to enhance mathematics and science education. Students construct their own computer-enhanced experiences using probe/software systems to study the behavior of real-world systems and computer simulation software packages to model the behavior of those systems.
Prerequisite: EST 100 or CSE 101
3 credits

**EST 302 Assessment of Computer-Based Technologies**
Methodologies for assessing the impact of computer-based technologies on economics, decision making, division of labor, and societal issues such as privacy and ethics. Frame of reference for assessing technologies, as well as applications of standard approaches such as benefit-cost analysis. Case studies drawn from robotics, banking, automation in the U.S. postal system, and other areas.
Prerequisite: EST 100 or any CSE course
3 credits

**EST 303 Crisis Communications**
Explores the emerging fields of crisis and risk communications through case studies. Oil spills, cyber crimes, medical device malfunctions, product tampering, and recalls are among the types of crises studied. Also examines crisis prevention, crisis plan development, risk management, and the instances in which organizations struggle to speak truthfully about risks that arouse public fear.
Prerequisite: U3 or U4 standing
3 credits

**EST 305 Applications Software for Information Management**
Introduction to the role of applications software in various types of organizations on the basis of emphasizing on methods of formulating the requisite information flows to engender adequate communications, operation, and control. The importance of audit ability, maintainability, and recoverability in systems design is stressed.
Provides students with knowledge of basic techniques and elementary skills in representing system structure with application of the principles in practical case study using spreadsheet and database software. Extensive interaction with applications software reinforces concepts presented.
Prerequisite: EST 100 or CSE 101
3 credits

**EST 320-H Communication Technology Systems**
Emphasizes basic science and engineering concepts underlying design and usage of modern telecommunications systems. Considers effects of human factors and societal constraints on design and development of nascent technological systems. Includes the electromagnetic spectrum, analog and digital signals and noise as well as societal considerations of government regulations, international competition, and environment.
Prerequisites: MAT 123; one D.E.C. category E course
3 credits

**EST 325-H Technology in the Workplace**
A study of automation and information technologies in both manufacturing and service industries. Considers how technology is changing the work and lives of everyone from production workers to executives. Case studies and how technology can improve quality and productivity and how incorrect use produces disappointing results.
Prerequisites: Completion of D.E.C. category E course
3 credits

**EST 330-H Natural Disasters: Societal Impacts and Technological Solutions**
A study of the physical causes of natural disasters; their societal impacts in developed and developing nations; the use of engineering, architecture, and regional planning to reduce vulnerability and loss; and the institutional mechanisms, both domestic and international, for promoting cross-cultural technology transfer and post-disaster assistance. Case studies of disasters in a number of countries are included.
Prerequisites: U3 or U4 standing; one D.E.C. category E course
3 credits

**EST 391-H Technology Assessment**
A multidisciplinary analysis of the environmental, economic, scientific, engineering, social, and ethical impacts of a technology and of policies for controlling them. Each class, often working with research teams and visiting area facilities, concentrates on topics such as plastics recycling, the future of the automobile, nuclear power, nanotechnology, space stations, virtual reality, biotechnology, smart weapons, and the Internet.
Prerequisites: PHY 132/134 or CHE 132 or BIO 201 or 202 or 203; MAT 127 or 132 or 142 or AMS 161
3 credits

**EST 392-F Engineering and Managerial Economics**
Applications of fundamental economics principles and systems analysis to problems of planning and design in manufacturing or service sectors of industry. Includes the time value of money, analysis of various types of cash flows, development of rate of return, and benefit-to-cost ratios in their use to evaluate competing investment programs. The role of depreciation and investment tax credits on the level of corporate taxation leading to the determination of after-tax rates of return.
Prerequisites: U3 or U4 standing in a CEAS major or economics major
3 credits

**EST 393 Production and Operations Analysis**
Development of analytical techniques useful in supplying information for planning purposes in the manufacturing and service sectors. Introduction to mathematical modeling of production, inventory, distribution, and service systems using linear programming, network, and probabilistic methods. Applications of forecasting and materials requirements planning in the development of resources to meet anticipated needs.
Prerequisite: EST 391
3 credits

**EST 411-H Science, Technology, and Arms Control**
A study of the application of scientific technology to national defense, covering nuclear weapons and delivery systems, chemical and biological weapons, conventional weapons systems, defense research and development, arms control and disarmament negotiations, and international technology transfer. This course is offered as both EST 411 and POL 411.
Prerequisites: U3 or U4 standing; one D.E.C. category E course
3 credits

**EST 412 Intelligence Organizations, Technology, and Democracy**
The role of intelligence organizations in decision making through analysis of agency practices in support of U.S. national security policy. The course also explores the roles of intelligence agencies and practices in democratic societies. This course is offered as both EST 412 and POL 412.
Prerequisites: U3 or U4 standing; POL 101 and 102; one D.E.C. category E course
5 credits

**EST 420 Seminar on Information-Age Society**
The characteristics of and current trends in telecommunications technology. Science and engineering concepts are applied as students analyze case studies focusing on the migration of entertainment media into the digital era, computer-generated speech, interactive cable television, and other current technologies. Engineering technology design constraints, critical success factors, and ethics for a technological world are explored.
Prerequisite: EST 320
3 credits

**EST 440 Interdisciplinary Research Methods**
Uses scientific research and related engineering technology problem-solving as a framework for the synthesis of various disciplines studied by students in the first three undergraduate years. Provides students with experience in team problem-solving. Students develop a proposal for interdisciplinary research or projects to be carried out in the final semester of study.
Prerequisites: TSM major; U4 standing; EST 395
3 credits

**EST 441 Interdisciplinary Senior Project**
Students carry through to completion their own research, development, or product evaluation project based on the proposal submitted and approved in EST 440. Requires practical steps including gathering facility mentorship, creating a schedule, assembling resources, conducting research or working on proto-
type, and a final paper and presentation. 
Prerequisite: EST 440

3 credits

EST 421 Starting the High-Technology Venture
Introduces engineering and applied science students to start-up and early development of a new high-technology venture. Turning a concept into a new venture. Identifying and evaluating product and market. Issues of feasibility, patents, and prototypes. 
Prerequisites: CEAS major; U4 standing

3 credits

EST 475 Undergraduate Teaching Practicum
Students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course. The student receives regularly scheduled supervision from the faculty instructor. May be used as an open elective only and repeated once. 
Prerequisites: U4 standing; a minimum g.p.a. of 3.00 in all Stony Brook courses and a grade of B or better in the course in which the student is to assist; permission of department

3 credits

EST 499 Research in Technology and Society
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, CSE 487, ESE 499, EMS 499, EST 499, ISE 487, MEC 499) may be counted toward engineering technical elective requirements. 
Permission: Permission of instructor

0-3 credits

EUR

European Studies

EUR 101-G Foundations of European Culture
This course presents students with the thinking from a variety of disciplines that influenced the development of the diverse national cultures of Europe. Students are exposed to a chronological representation of the major ways that classical Greek, Roman, Judeo-Christian, and Islamic cultures contributed to the making of individual national cultures and identities of the major countries of Europe. 

3 credits

EUR 201-I Development of European Culture
An introduction to the important literary works that arose from major European cultural and intellectual movements and an examination of their continued influence on the modern world. Readings focus on central texts pertaining to core religious issues, the Renaissance, the Enlightenment, Romanticism, Realism, Modernism, and Post Modernism. Examples from the arts, including film, music, and theatre, are used to illustrate the influence of the literary works. 
Prerequisite: Completion of D.E.C. category B

3 credits

EUR 390-I Special Topics in European Studies
Semester supplements to this Bulletin contain descriptions when the course is offered. May be repeated as the topic changes. 
Prerequisite: U3 or U4 standing

Advisory Prerequisite: To be announced with the topic

EUR 401 Senior Research Seminar in European Studies
Intensive investigation of specific topics within the European Studies concentrations. Students will develop their skills in selecting a relevant topic, problematizing it, conducting research and writing on it in a persuasive fashion, presenting their findings in the seminar, and submitting a written paper at least 20 pages in length. 
Prerequisites: EUR 201; 15 additional credits in the major; U4 standing; European Studies major

3 credits

EUR 447 Directed Readings in European Studies
Independently supervised readings in selected topics in European Studies. May be repeated. 
Prerequisite: Permission of instructor

1-6 credits

EUR 475, 476 Undergraduate Teaching Practica in European Studies I, II
Students aid instructors and students in European Studies courses in one or several of the following ways: leading discussions, helping students improve writing and research skills, and library research. Students meet regularly with the supervising instructor. In EUR 476, students assume greater responsibility in areas such as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice. 
Prerequisites to EUR 475: U3 or U4 standing; permission of instructor and department; EUR major or minor
Prerequisites to EUR 476: EUR 475; permission of instructor and department; EUR major or minor

3 credits per course, SU grading

EUR 487 Independent Project in European Studies
The designing and carrying out of a research project selected by the student and arranged by the student and the instructor. May be repeated once. 
Prerequisite: Permission of instructor

0-6 credits

EUR 488 Internship in European Studies
Participation in local, state, national, and international public and private agencies and organizations to apply and reinforce language and related skills and knowledge of social and cultural institutions. May be repeated up to a limit of 12 credits. 
Prerequisites: Permission of instructor and department

0-6 credits, SU grading

EUR 495 Senior Honors Project in European Studies
A one-semester project for seniors. Arranged in consultation with the department, the project involves writing a paper, under the close supervision of an appropriate instructor, on a suitable topic. Students who are candidates for honors take this course. 
Prerequisites: Permission of instructor and department

3 credits

EXT

Externships

EXT 488 Internship
Participation in an off-campus or on-campus agency or organization that provides students the opportunity to learn to apply their University studies to areas of work experiences. Internships must be sponsored by a faculty member. Request for approval of the internship manager in the Career Center must be submitted no later than two days prior to the last day of the add period as scheduled in the academic calendar. Students may register for only one 488 course per semester. May be repeated up to a limit of 12 credits. 
Prerequisites: Minimum g.p.a. of 2.50; U3 standing; one prior semester of attendance at Stony Brook; acceptance by faculty sponsor; permission of appropriate department and internship manager

0-6 credits, SU grading

FLA

Foreign Language Secondary Education

FLA 339 Methods and Materials in the Teaching of Foreign Languages
A review of methods and materials for the teaching of foreign languages and literatures in the secondary schools. Special attention is given to the problems and purposes of the teaching of foreign languages at the high school level. 
Prerequisites: Admission to a Foreign Language Secondary Teacher Education program; C or higher in one 300-level foreign language course; C or higher in one 300-level Literature course; minimum GPA of 2.75
Corequisite: FLA 449

3 credits

FLA 340 Curriculum Development and Micro-Teaching
A course designed to train future language teachers in the development of well-articulated programs in secondary schools. Students have the opportunity to enjoy clinical experiences in school settings. Special attention is given to lesson planning, classroom management, and portfolio development. 
Prerequisites: C or higher in FLA 339; minimum g.p.a. of 2.75
Corequisite: FLA 450

3 credits

FLA 439 Introduction to Technology for Language Teaching
An introduction for potential teachers to how technologies are used for language learning and teaching. Technologies include audio, video, satellite, computer and Internet. Students explore the interaction between second language acquisition, language pedagogical theory, and technology. 
Prerequisite: FLA 339

3 credits

FLA 440 Foreign Language Acquisition Research
A study of recent trends in foreign language acquisition research. The focus is on classroom-based research: qualitative and quantitative research methodologies, variables in classroom-based learning research, analysis of research results. Students conduct classroom research studies, present their findings, and address applications of their findings to