ESL

English as Second Language

ESL 191 Intermediate Oral/Aural Skills
Students improve skills necessary for speaking and understanding English with special emphasis on developing communication capabilities. Class work includes pronunciation modification, presentation skills, and cultural awareness in the classroom. Language and listening laboratories required. A diagnostic test during the first week of classes determines placement in the course.
3 credits

ESL 192 Intermediate Composition
A course for students who have attained a degree of fluency in speaking English but need additional training in reading and writing skills. Beginning with basic sentence patterns and working toward paragraph development and eventually essays, each student has the opportunity to practice many different varieties of writing. May be repeated but counts only once toward graduation. Writing placement examination score determines placement in the course. A through C/Unsatisfactory grading only. The Pass/No Credit option may not be used. Prerequisite: Level 1 on the writing placement examination.
3 credits, ABC/U grading

ESL 193 Advanced Composition
Advanced training in writing for ESL students who need to concentrate on paragraph and essay development. The course deals with the development of a variety of essay genres, including the personal narrative, summary/response and argumentation/persuasion. Key grammar points are reviewed and are expected to be mastered. May be repeated but counts only once toward graduation. Writing placement score or successful completion of ESL 192 determines placement in the course. A through C/Unsatisfactory grading only. The Pass/No Credit option may not be used. Prerequisite: Level 2 on the writing placement examination or ESL 192
3 credits, ABC/U grading

ESL 194 Academic English Skills for U.S. Residents
The study of spoken and written English for students who are graduates of American high schools but are non-native speakers of English. The focus of the course is on helping students to speak, write, and understand English in academic contexts. Particular attention is paid to understanding lectures, increasing vocabulary, and improving knowledge of English sentence structure. Open to first semester English enrichment program students only. A through F grading only. The Pass/No Credit option may not be used. Only for students in the English Enrichment Program.
3 credits

ESL 198 Advanced Oral/Aural Skills and Accent Improvement
An advanced course in speaking and listening skills for non-native speakers of English. Work is done with individual problems sounds, stress, and intonation in order to help students modify their accents and make their speech more intelligible. Techniques of speaking before a group are taught to enable non-native speakers to feel more confident in participating in their other classes. Advanced work in American idioms and grammar is usually included. Language laboratory work may be required by individual instructors. Especially useful for undergraduate and graduate students who need to make seminar presentations and for graduate students with teaching assistantships.
3 credits

ESG 440 Engineering Science Design III
Lectures by faculty members and visitors on typical design problems encountered in engineering practice. During this semester each student chooses a senior design project. A preliminary design report is required. Not counted as a technical elective. Laboratory fee required. Prerequisites: ESG 316; ESG major; U4 standing
3 credits

ESG 441 Engineering Science Design IV
Student groups carry out the detailed design of the senior projects chosen during the first semester. A final and detailed design report is prepared. Not counted as a technical elective. Laboratory fee required. Prerequisite: ESG 440
3 credits

ESG 448 Cooperative Research in Technological Solutions
An independent research course in which students apply principles of engineering design, technological problem solving, mathematical analysis, computer-assisted engineering, and effective teamwork and communication to develop solutions for a need in a governmental, educational, non-profit, or community organization in a multidisciplinary setting. Prerequisites: U3 or U4 standing; an abstract of the project; permission of instructor
0-2 credits

ESG 487 Cooperative Research in Technological Solutions
An independent research course in which students apply principles of engineering design, technological problem solving, mathematical analysis, computer-assisted engineering, and effective teamwork and communication to develop solutions for a need in a governmental, educational, non-profit, or community organization in a multidisciplinary setting. Prerequisites: U3 or U4 standing; an abstract of the project; permission of instructor
0-2 credits

ESL

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, crystal structure, defects, and 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 143 or 199, ESG 111 or ESE 114 or MEC 111 or MEC 112, MAT 132 or 127 or 142 or 171 or AMS 101; PHY 126 or 131/133 or 141
3 credits

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
0-2 credits

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 vector 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
3 credits

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 coatings, electro-magnetic devices and shape memory alloys. Prerequisite: ESG 332
3 credits

ESM 335 Strength of Materials
The mechanical behavior of materials, assuming a basic knowledge of elasticity, plasticity, fracture and creep. Provides 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
3 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 photovoltaic 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 physical characteristics 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 on statistical 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). This course is offered as both ESM 353 and BME 553. Prerequisite: ESG 332
3 credits