

POLYMER ENGINEERING (PLYE)

PLYE 101 Tools for Polymer Science and Polymer Engineering (2 Units)

This is an introductory course for Polymer Science and Polymer Engineering (PSPE) undergraduate major. Students will learn the use of spreadsheet generating software for data analysis and graphing and MATLAB to perform mathematical computation. Engineering drawing and graphics using SOLIDWORKS software and elements of engineering ethics will be covered in this course. (Formerly 9841:101)

PLYE 102 Tools for Polymer Technology (2 Units)

Prerequisite: PSPE 100. The course trains students in tools they will need for the Associate in Applied Science of Polymer Technology degree program. These include basic word-processing skills, use of spreadsheet generating software for data analysis and graphing using examples drawn from polymer applications.

PLYE 206 Introduction to Coatings (3 Units)

Prerequisites: CHEM 101 and PSPE 100. This associates-level course introduces students to coating technologies, methods of application, coatings testing, and practical components of coatings. Students will be able to understand what the different coatings are, how they are applied, what physical properties they exhibit and how to measure these properties

PLYE 207 Troubleshooting in Polymer Technology (1 Unit)

Prerequisites: CHEM 101, PLYE 102, PHYS 261, and EEET 120. Pre/Corequisites: PLYS 203 and PLYS 204. This associates-level course trains students on calibration techniques and sources of effective error in common equipment used in the elastomer, plastic, and coatings industries.

PLYE 321 Polymer Fluid Mechanics (3 Units)

Prerequisites: CHEE 321, senior standing, and full admission to an engineering major in the College of Engineering and Polymer Science. This undergraduate course introduces the rheological properties and flow characteristics of polymer fluid systems. It covers non-Newtonian viscosity of polymer melts and solutions, viscoelasticity of polymer melts and solids, measurement methods, and interpretation of rheological properties. (Formerly 9841:321)

PLYE 324 Quantitative Polymer Analysis (3 Units)

Prerequisites: MATH 223, MATH 335, and full admission to an engineering major in the College of Engineering and Polymer Science. This is an undergraduate course on quantitative analysis problems in polymer engineering. This course will allow the students to learn and use necessary analytical methods in designing and optimizing processes in the field of the polymer. The solution to the linear and nonlinear first and higher-order differential equations are provided by analytical methods. Students will be exposed to various concepts in linear algebra and will use dimensional analysis tools, such as the Buckingham theorem to identify key parameters that govern the physics of the problem. Furthermore, different techniques, such as separation of variables, similarity transformation, and furrier transform, to solve partial differential equations will be covered. (Formerly 9841:324)

PLYE 330 Polymer Thermodynamics (3 Units)

Prerequisites: MATH 223 and full admission to an engineering major in the College of Engineering and Polymer Science. This undergraduate course provides an introduction to thermodynamics including the fundamental laws, equations of state, phase equilibria, binary blends, and their corresponding phase diagrams. Polymeric materials are emphasized in the implementation of thermodynamics. (Formerly 9841:330)

PLYE 333 Polymer Thermodynamics Laboratory (2 Units)

Prerequisite: Full admission to an engineering major in the College of Engineering and Polymer Science. Corequisite: PLYE 330. Laboratory course providing hands-on experiments in polymer thermodynamics. (Formerly 9841:333)

PLYE 422 Polymer Processing (3 Units)

Prerequisite: Full admission to an engineering major in the College of Engineering and Polymer Science. Pre/Corequisite: CHEE 321 or MECE 310. Polymer processing technology. Basic studies of flow in extrusion, molding, and other processing methods. (Formerly 9841:422)

PLYE 423 Injection Molding and Mold Design (3 Units)

Prerequisites: PLYE 321, PLYE 422, senior standing and full admission to an engineering major in the College of Engineering and Polymer Science. This course presents an in-depth analysis of injection molding processes for manufacturing of an array of polymer-based articles used in consumer, automotive, and aerospace industries. The knowledge garnered in PLYE 321 Polymer Fluid Mechanics and PLYE 422 Polymer Processing will form the basis for elaborating the influence of polymer melt flow in the mold, heat transfer out of the mold, polymer chain orientation, and polymer chain crystallization on the quality of injection molded products and their properties. (Formerly 9841:423)

PLYE 424 Additive Manufacturing with Polymers (3 Units)

Prerequisites: PLYE 321, PLYE 422, senior standing and full admission to an engineering major in the College of Engineering and Polymer Science. This course presents the essence of additive manufacturing technology of polymers to keep senior undergraduate students abreast on the paradigm shift in manufacturing of products that vary widely in dimensions, e.g., from a few millimeters to almost a meter with minimal wastes. Cases of additive manufacturing with thermoplastic and thermosetting polymers are discussed. Product designs, machines, and materials selection are covered. (Formerly 9841:424)

PLYE 425 Introduction to Blending & Compounding Polymers (3 Units)

Prerequisites: CHEE 321 or MECE 310 or permission. Nature of polymer blends and compounds and their applications. Preparation and technology using batch and continuous mixers, mixing mechanisms. (Formerly 9841:425)

PLYE 427 Mold Design (3 Units)

Prerequisites: CHEE 321 or MECE 310 or permission. Molding methods to manufacture polymeric products. Machinery, materials, molds, equipment, computer-aided design. (Formerly 9841:427)

PLYE 450 Engineering Properties of Polymers (3 Units)

Prerequisite: CHEE 305 or CIVE 201 or PSPE 202. Mechanical behavior of solid polymers including elastic and plastic deformation, viscoelasticity, fatigue and failure. (Formerly 9841:450)

PLYE 451 Polymer Engineering Laboratory (3 Units)

Prerequisites: PLYE 321, PLYE 422, senior standing and full admission to an engineering major in the College of Engineering and Polymer Science. This course teaches students how to conduct laboratory experiments on rheological characterization of polymer melts, rubber and plastics extrusion, extrudate swell, injection and compression molding, 3-D printing, and impact and tensile testing. (Formerly 9841:451)

PLYE 496 Senior Design Project I (3 Units)

Prerequisites: PLYE 324, PLYE 330, senior standing and full admission to an engineering major in the College of Engineering and Polymer Science. Corequisite: PLYE 422. This is a design course in which the students will be actively involved in implementing design principles to synthesize new materials, to evaluate the performance of polymer materials, to design a processing scheme, or manufacture polymer products. The students will acquire skills in identification and ranking of factors, identification of materials systems, development of design of experiments, and evaluation of factors. The learning outcomes will be documented in detailed project reports. (Formerly 9841:496)

PLYE 497 Honors Project (3 Units)

Prerequisites: Senior standing in the Honors Program and full admission to an engineering major in the College of Engineering and Polymer Science. This is a design course in which the students will be actively involved in implementing design principles to synthesize new materials, to evaluate the performance of polymer materials, to design a processing scheme, or manufacture polymer products. The students will acquire skills in identification and ranking of factors, identification of materials systems, development of design of experiments, and evaluation of factors. The learning outcomes will be documented in detailed project reports. (Formerly 9841:497)

PLYE 498 Research Problems in Polymer Engineering (1-9 Units)

Prerequisite: Permission of Department Chair. Faculty-supervised undergraduate research problems in polymer engineering culminating in a written report. (Formerly 9841:498)

PLYE 499 Senior Design Project II (3 Units)

Prerequisites: PLYE 321, PLYE 496, PLYS 405, senior standing and full admission to an engineering major in the College of Engineering and Polymer Science. This is a capstone course in which the students demonstrate mastery of the learning outcomes of this undergraduate degree program by completing challenging projects that have societal value. (Formerly 9841:499)

Gen Ed: Capstone