Polymer and Color Chemistry (PCC)

PCC 101 Introduction to Polymer and Color Chemistry (2 credit hours)
Introduction of topics related to Polymer and Color Chemistry, e.g. fiber and fiber forming polymers, polymerization methods, into to color assessment methods, various chemistry disciplines, molecular interactions, periodic table, acids, bases, solutions, into to and examples of textile coloration and textile finishing techniques.

Corequisite: PCC 104
Typically offered in Fall only

PCC 104 Introduction to Polymer and Color Chemistry Lab (1 credit hours)
An introduction to hands-on laboratory work for the study of basic polymer principles, dye synthesis, forensic analysis and coloration of fibers.

Corequisite: PCC 101
Typically offered in Fall only

PCC 106 Polymer Chemistry and Environmental Sustainability (3 credit hours)
Polymers are prevalent in almost every part of our lives. Many polymers are petroleum based and their raw material supply is limited. Using a theme of environmental impact, this course will review the origin and preparation of key industrial raw materials and how they are used in polymer synthesis. Properties of synthetic polymers will be introduces and concepts for establishing sustainable polymers will be discussed.

Prerequisite: CH 101 or CH 103; Corequisite: CH 221 or CH 225
Typically offered in Spring only

PCC 201 Impact of Industry on the Environment and Society (3 credit hours)
Relationship of society to safety and environmental aspects of manufactured products. Quantifying manufacturing risks. Protective methods, e.g. administrative, engineering, personal, treatment, pollution prevention. Social factors, e.g. political, regulatory, legal, consumer attitudes, public policy, perceptions. Understanding complex social issues, especially situations with conflicting goals. Critical comparison of options for risk reduction, and selecting reasonable (hopefully optimal) courses of action in complex and uncertain situations. Unsolved problems of industry and society (e.g. greenhouse effect). Relationships of ethics, laws and regulations to manufacturing.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

PCC 274 Introduction to Forensic Science (3 credit hours)
The field of forensic science is the application of science to the law. The primary purpose of this course is to introduce students to the 'real world' of forensics. It will serve as a basis for more advanced forensic courses. Solving crimes are often complex and costly affairs, involving myriad science and engineering disciplines, ethics, legal issues, and strong communication skills. These key areas will be introduced via regular course lectures, guest lectures from faculty members within NC State and other institutions, and guest lectures from current or former field agents and professional forensic scientists.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

PCC 301 Technology of Dyeing and Finishing (3 credit hours)
Basic principles and procedures for the preparation, dyeing, printing, and finishing of natural and man-made fibers. The chemical nature of dyes and fastness properties and the chemical nature of finishes used to impart specific end-use properties.

Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 304
Typically offered in Fall and Spring

PCC 302 Technology of Textile Wet Processing (4 credit hours)
Introduction to the science and technology used in textile wet processing. Topics include preparation, dyeing, printing and finishing of textiles, basics of color generation and measurement. Emphasis mainly on cotton, wool, nylon and polyester. Laboratory includes experiments in wet processing and a project on statistical analysis of fabric defects.

Prerequisite: (TT 105 or MT 105 or PCC 101) and (TMS 211 or TE 201) and CH 101 and (PY 211 or (PY 205 and PY 206).
Typically offered in Fall and Spring

PCC 304 Technology of Dyeing & Finishing Laboratory (1 credit hours)
Laboratory experience involving the preparation, dyeing, printing, and finishing of natural and man-made fibers.

Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 301
Typically offered in Fall and Spring

PCC 350 Introduction to Color Science and Its Applications (2 credit hours)
Basic principles and applications of color science. Physical, physiological and psychophysical aspects of color, color perception, color specification, color measurement and color control.

Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 354
Typically offered in Spring only

PCC 354 Intro to Color Science Laboratory (1 credit hours)
An introdiction to hands-on laboratory work for the color measurement and perceotion of colored materials.

Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 350
Typically offered in Spring only

PCC 404 Introduction to the Theory and Practice of Fiber Formation (3 credit hours)
Flow behavior of polymeric materials as related to the formation of fibers by melt, dry and wet extrusion. Elementary theories of drawing and heat setting. Application of fiber-forming theories to synthetic and cellulosic fibers. Offered in Fall only.

Prerequisite: TE 200 and (CH 201 or CH 203) and ((PY 208 and PY 209) or PY 212) and (MA 231 or MA 241)
Typically offered in Fall and Spring

PCC 410 Textile Preparation and Finishing Chemistry (3 credit hours)
Topics in textile wet processing. Chemical mechanisms and unit operations in fabric preparation and finishing.

Prerequisite: PCC 301
Typically offered in Fall only

PCC 412 Textile Chemical Analysis (2 credit hours)
Application of analytical techniques for analysis to fibers, textile chemicals and textile processes; atomic absorption, ultraviolet, visible, near-infrared and infrared spectrophotometer; chromatography; interfacial tension; calorimetric, gravimetric and complexometric analyses. Emphasis on interpretation of data and solving problems of analysis for quantitate and characterization purposes.

Prerequisite: PCC 301 and (CH 331 or CH 433 or TE 303); Corequisite: PCC 414
Typically offered in Spring only

PCC 414 Textile Chemistry Analysis Lab (1 credit hours)
Laboratory course in the application of analytical techniques for analysis of fibers, textile chemicals and textile processes; atomic absorption, ultraviolet, visible, near-infrared and infrared spectrophotometery; chromatography; interfacial tension; calorimetric, gravimetric and complexometric analyses. Emphasis on interpretation of data solving problems of analysis for quantitavive and characterization purposes.

Prerequisite: PCC 301 and (CH 331 or CH 433 or TE 303); Corequisite: PCC 412
Typically offered in Spring only

PCC 420 Textile Dyeing and Printing (3 credit hours)
Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing.

Prerequisite: PCC 301
Typically offered in Spring only

PCC 442 Theory of Physico-Chemical Processes in Textiles II (3 credit hours)
Second semester of a two-semester sequence. Ideal and non-ideal solutions, colligative properties. Electro chemistry, dyeing isotherms, chemical kinetics, surface chemistry, theory of repellency and other special topics.

Prerequisite: TE 303 or CH 331 or CH 433
Typically offered in Fall only

PCC 461 Chemistry of Polymeric Materials (3 credit hours)
Polymers are a critical component of most products used by society today. Knowledge of their formation and properties is key to development of the materials of the future. The formation and properties of the major polymers are the primary focus areas of this course, including Step-growth and Chain-growth polymerization, formation techniques for preparation of synthetic fibers and the fundamental relationships between chemical structure and physical properties of natural and synthetic polymers.

Prerequisite: (CH 220 and TE 200) or CH 223 or CH 227; Corequisite: PCC 464
Typically offered in Fall only

PCC 462 Characterization and Physical Properties of Polymers (3 credit hours)
This survey of polymer physics connects polymer chains' chemical structures and environmental conditions to their observable properties via conformations using statistical mechanics concepts. The following topics are discussed: microstructural parameters, conformational parameters, ideal and other chain models, polymer statistical thermodynamics, chain and network mechanics, polymer solutions and mixing, polymer states of matter and thermal transitions, and characterization methods. The course is not a substitute for dedicated courses on analytical chemistry, physical chemistry, or mechanics/rheology, but does present concepts from these disciplines.

Typically offered in Spring only

PCC 464 Chemistry of Polymeric Materials Laboratory (1 credit hours)
Polymers are a critical component of most products used by society today. Understanding their formation and properties is key to development of the materials of tomorrow. This laboratory course is focused on preparation of the major synthetic polymers using step-growth and chain-growth polymerization techniques. The properties of the resultant polymers are studied.

Prerequisite: (CH 220 and TE 200) or CH 223 or CH 227; Corequisite: PCC 461
Typically offered in Fall only

PCC 466 Polymer Chemistry Laboratory (3 credit hours)
Synthesis and characterization of polymers; thermodynamics of rubber elasticity and gelation; spectroscopic, thermal and scattering techniques for polymer analysis. The processing of polymers into fibers and films.

Prerequisite: (CH 331 or TE 303 or CH 433) and Senior Standing
Typically offered in Spring only

PCC 471/MT 471 The Chemistry of Synthetic and Natural Bipolymers (3 credit hours)
Introduction to natural and synthetic biopolymers used for biomedical applications. Goals and challenges of biomaterials selection for biomedical engineering. Polymer concepts of polymerization and characterization. Sources/synthesis, chemical and physical properties and degradation mechanisms are described. Polymer classes include: polysaccharides, proteins, polyesters, polyurethanes, polyanhydrides and polyethers.

Prerequisite: CH 220 or 221 or 225
Typically offered in Spring only

PCC 474 Forensic Chemistry Laboratory (3 credit hours)
Forensic chemistry is the application of chemistry to the law. It is a key part of crime scene investigations. In this course, students work in teams and discover standard methods of crime scene processing, latent evidence processing and analysis of materials and chemicals germane to forensic trace evidence. Advanced analytical chemistry techniques will be learned and applied to solve a 'crime' with suspects. Students will attempt to solve the crime and will present their analytical evidence in a courtroom setting with cross-examination.

Prerequisite: (CH 220 or CH 223 or CH 227) and TMS 211
Typically offered in Fall only
This course is offered alternate even years

PCC 490 Undergraduate Research in Polymer and Color Chemistry (1-6 credit hours)
Faculty-supervised individual research for undergraduates in PCC. Students must find an advisor from within the department with whom to work on a regular basis. Intended for PCC majors. Individualized/ Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: PCC 301 and PCC 461/CH 461 and (TE 303 or CH 331 or CH 433).
Typically offered in Fall and Spring

PCC 491 Seminar in Polymer and Color Chemistry (1 credit hours)
Familiarizes student with the principal sources of polymer and color chemistry literature and emphasizes importance of keeping abreat of developments in the field. Emphasizes fundamentals of technical writing. Arranged. Intended for PCC majors3

Prerequisite: Senior standing
Typically offered in Fall, Spring, and Summer

PCC 492 Special Topics in Polymer and Color Chemistry (3 credit hours)
Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.

Typically offered in Fall, Spring, and Summer