

# Coatings and Polymeric Materials (CPM)

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**CPM 194. Individual Study. 1-5 Credits.**

**CPM 196. Field Experience. 1-15 Credits.**

**CPM 199. Special Topics. 1-5 Credits.**

**CPM 291. Seminar. 1-5 Credits.**

**CPM 292. Study Abroad. 1-15 Credits.**

**CPM 294. Individual Study. 1-5 Credits.**

**CPM 299. Special Topics. 1-5 Credits.**

**CPM 379. Study Tour Abroad. 1-6 Credits.**

**CPM 391. Seminar. 1-3 Credits.**

**CPM 392. Study Abroad. 1-15 Credits.**

**CPM 394. Individual Study. 1-5 Credits.**

**CPM 399. Special Topics. 1-5 Credits.**

**CPM 451. Laboratory, Chemical, Radiation, and Biological Safety. 1 Credit.**

Hazards and safe practices in chemical, radiation and biological laboratories, applicable to all studies at NDSU. Recognized by the University as completion (for credit) of safety training to work in a research laboratory. {Also offered for graduate credit - see CPM 651.}.

**CPM 472. Environment and Chemical Industries. 2 Credits.**

Environmental issues as they pertain to the chemical industry. Topics to include environmental regulations, the issues with disposal and waste, and designing environmentally compliant processes. Recommended Prereq: CHEM 121. {Also offered for graduate credit - see CPM 672.}.

**CPM 473. Polymer Synthesis. 3 Credits.**

Chemical synthesis of all types of polymers, including the understanding and tailoring of materials formed by these very high molecular weight molecules. Polymers have unique properties due to their conformation and high molecular mass, and are used in a wide variety of applications from paints to structural, engineering materials. Recommended Prereq: CHEM 342. {Also offered for graduate credit - see CPM 673.}.

**CPM 474. Coatings I. 3 Credits.**

Synthesis of resins used in coatings systems, structure-property relationships for polymer binder systems, crosslinking and film formation concepts, solvents and other materials in coatings. Recommended Prereq: CHEM 342. {Also offered for graduate credit - see CPM 674.}.

**CPM 475. Coatings II. 3 Credits.**

Materials science of polymeric coatings, including their components, formulation, design, testing and application. Specialized topics include corrosion, color, appearance and adhesion. Recommended Prereq: CPM 474. {Also offered for graduate credit - see CPM 675.}.

**CPM 483. Polymer Practicum. 2 Credits.**

Focus on key synthetic methods for polymer synthesis, reaction kinetics, and the characterization methods. Students will be introduced to basic lab skills and the analytical tools used to synthesize and characterize macromolecules. Prereq: CPM 473.) {Also offered for graduate credit - see CPM 683.}.

**CPM 484. Coatings I Laboratory. 2 Credits.**

Preparation and testing of coatings, synthesis and characterization of resins, characterization of coatings. Laboratory counterpart to CPM 474. Recommended Coreq: CPM 474. {Also offered for graduate credit - see CPM 684.}.

**CPM 485. Coatings II Laboratory. 2 Credits.**

Formulation and application testing of coatings versus property requirements; color measurement and matching. Laboratory counterpart to CPM 475. 1 six-hour laboratory. Hours flexible. Recommended Prereq: CPM 484. Recommended Coreq: CPM 475. {Also offered for graduate credit - see CPM 685.}.

**CPM 486. Corrosion and Materials. 3 Credits.**

Corrosion science and engineering: basic electrochemistry of corrosion, measurement of corrosion, choice of materials in engineering design to mitigate corrosion, corrosion control by coatings, evaluation of corrosion protection, and areas of special corrosion problems. Recommended Prereq: CHEM 121 or CHEM 150. Cross-listed with CHEM 486. {Also offered for graduate credit - see CPM 686.}.

**CPM 487. Corrosion and Materials Laboratory. 1 Credit.**

The laboratory will allow the students to become acquainted with experimental techniques for the study of corrosion processes and the failure of materials. Additionally, the methods for protection of materials will be practiced. Recommended Co-req: CPM 486. {Also offered for graduate credit - see CPM 687.}.

**CPM 491. Seminar. 1-5 Credits.**

**CPM 492. Study Abroad. 1-15 Credits.**

**CPM 494. Individual Study. 1-5 Credits.**

**CPM 496. Field Experience. 1-15 Credits.**

**CPM 499. Special Topics. 1-5 Credits.**

**CPM 651. Laboratory, Chemical, Radiation, and Biological Safety. 1 Credit.**

Hazards and safe practices in chemical, radiation and biological laboratories, applicable to all studies at NDSU. Recognized by the University as completion (for credit) of safety training to work in a research laboratory. {Also offered for undergraduate credit - see CPM 451.}.

**CPM 672. Environment and Chemical Industries. 2 Credits.**

Environmental issues as they pertain to the chemical industry. Topics to include environmental regulations, the issues with disposal and waste, and designing environmentally compliant processes. {Also offered for undergraduate credit - see CPM 472.}.

**CPM 673. Polymer Synthesis. 3 Credits.**

Chemical synthesis of all types of polymers, including the understanding and tailoring of materials formed by these very high molecular weight molecules. Polymers have unique properties due to their conformation and high molecular mass, and are used in a wide variety of applications from paints to structural, engineering materials. {Also offered for undergraduate credit - see CPM 473.}.

**CPM 674. Coatings I. 3 Credits.**

Synthesis of resins used in coatings systems, structure-property relationships for polymer binder systems, crosslinking and film formation concepts, solvents and other materials in coatings. {Also offered for undergraduate credit - see CPM 474.}.

**CPM 675. Coatings II. 3 Credits.**

Materials science of polymeric coatings, including their components, formulation, design, testing and application. Specialized topics include corrosion, color, appearance and adhesion. Recommended Prereq: CPM 674. {Also offered for undergraduate credit - see CPM 475.}.

**CPM 683. Polymer Practicum. 2 Credits.**

Focus on key synthetic methods for polymer synthesis, reaction kinetics, and the characterization methods. Students will be introduced to basic lab skills and the analytical tools used to synthesize and characterize macromolecules. Prereq: CPM 673. {Also offered for undergraduate credit - see CPM 483.}.

**CPM 684. Coatings I Laboratory. 2 Credits.**

Preparation and testing of coatings, synthesis and characterization of resins, characterization of coatings. Laboratory counterpart to CPM 674. Recommended Coreq: CPM 674. {Also offered for undergraduate credit - see CPM 484.}.

**CPM 685. Coatings II Laboratory. 2 Credits.**

Formulation and application testing of coatings versus property requirements; color measurement and matching. Laboratory counterpart to CPM 675. 1 six-hour laboratory. Hours flexible. Recommended Prereq: CPM 684. Recommended Coreq: CPM 675. {Also offered for undergraduate credit - see CPM 485.}.

**CPM 686. Corrosion and Materials. 3 Credits.**

Corrosion science and engineering: basic electrochemistry of corrosion, measurement of corrosion, choice of materials in engineering design to mitigate corrosion, corrosion control by coatings, evaluation of corrosion protection, and areas of special corrosion problems. Cross-listed with CHEM 686. {Also offered for undergraduate credit - see CPM 486.}.

**CPM 687. Corrosion and Materials Laboratory. 1 Credit.**

The laboratory will allow the students to become acquainted with experimental techniques for the study of corrosion processes and the failure of materials. Additionally, the methods for protection of materials will be practiced. Recommended Co-req: CPM 686. {Also offered for undergraduate credit - see CPM 487.}.

**CPM 690. Graduate Seminar. 1 Credit.****CPM 695. Field Experience. 1-15 Credits.****CPM 696. Special Topics. 1-5 Credits.****CPM 771. Modern Methods of Polymer Characterization. 3 Credits.**

Understanding the physical properties of polymers and methods for their characterization. Focusing on the significance and interplay of physical parameters and the underlying physics of the characterization methods.

**CPM 773. Organic Chemistry Of Coatings. 3 Credits.**

Synthesis of polymers used in coating systems, polymers having tailored and defined architectures; crosslinking reactions used in coatings. Recommended Prereq: CHEM 741.

**CPM 775. Color And Appearance. 3 Credits.**

Topics in color and appearance in coatings, Colorimetry, Color and Gloss Measurement, Optical Properties of Pigments, Opacity, CIE and LAB Color Spaces, Color Matching. Recommended Prereq: CPM 675.

**CPM 778. Physical Chemistry of Polymers. 3 Credits.**

Examines the interrelationships among polymer structure, morphology, physical state and properties. Key aspects include molecular weight, and its distribution, and the organization of the atoms along the polymer chain. Recommended Prereq: CPM 673.

**CPM 782. Physical Chemistry Of Coatings. 3 Credits.**

Thermodynamics of interfaces, transport in coatings, colloid stability, advanced CPVC concepts, film formation, particle size effects, and theories of coating application methods. Recommended Coreq: CPM 674.

**CPM 790. Graduate Seminar. 1 Credit.****CPM 791. Temporary/Trial Topics. 1-5 Credits.****CPM 793. Individual Study/Tutorial. 1-5 Credits.****CPM 795. Field Experience. 1-15 Credits.****CPM 796. Special Topics. 1-5 Credits.****CPM 798. Master's Thesis. 1-10 Credits.****CPM 899. Doctoral Dissertation. 1-15 Credits.**