

# PREMEDICINE

SPS Certificate website: <https://sps.northwestern.edu/premedicine-prohealth/premedicine/>

Students in the premedicine post-baccalaureate certificate program have the opportunity to meet their educational goals at a world-class university. The program admits post-baccalaureate students seeking the laboratory science courses in biology, general and organic chemistry, and physics required for the application to most medical, dental, veterinary, and related professional schools.

The highly regarded Northwestern University curriculum and faculty give students an in-depth science foundation. The premedical coursework can be completed in 15, or 21 months, depending on the student's needs. This program is designed for career changers and students who have not completed the coursework needed to apply to medical school — students who have already completed the premedical coursework should instead apply to the Advanced Studies in Biology for Health Professions certificate (<https://catalogs.northwestern.edu/sps/certificates/post-baccalaureate/advanced-studies-biology-health-professions/>).

## Program Features

### Professional Health Proseminar 1 and 2

Proseminar 1: This course covers topics including adjusting to life as a science student, academic resources, guidance for finding research and clinical opportunities, and preparing for the professional/medical school application process.

Proseminar 2: This course prepares students for the application cycle. The course will provide opportunities for students to work on major application components as part of the coursework, including their AMCAS activities listing, preparing a strong personal statement, selecting target medical/professional schools, and navigating the centralized application. The course will also allow students to practice their interviewing skills and plan for their glide year.

Tuition is not charged for the proseminar courses.

### Northwestern University Pre-Health Professionals Student Group

The NUPP student group is first and foremost a community dedicated to the successful admission of its members into programs that lead to careers in medicine, health, and veterinary practice. In addition, NUPP serves as a forum for the discussion and presentation of professional and academic experiences, as a collective resource of relevant information, as a social network and as a representative for the body of non-traditional pre-health students and their unique needs.

### Physician Shadowing Program

Thanks to a collaboration between SPS and Northwestern Memorial Hospital (NMH), SPS premedicine students have the opportunity to shadow physicians, an integral part of the preparation needed for medical school. Students are selected for these shadowing opportunities through an application process during their program.

## Premedicine Student Performance

The rigor of Northwestern's Premedicine post-bacc program prepares students for successful application to and completion of programs at top medical schools nationwide.

514: Average MCAT score of Northwestern Premed post-bacc students (U.S. national average is 506<sup>1</sup>)

<sup>1</sup> 2019 data from American Medical College Application Service (AMCAS®)

## Medical School Acceptances

SPS premedicine students are competitive candidates for medical school application and have been accepted to prestigious schools such as Harvard University, Johns Hopkins, Columbia University, Washington University, University of Michigan, Yale University, New York University, University of Chicago, University of Pittsburgh, and Northwestern University. View the list of recent medical school acceptances (<https://sps.northwestern.edu/premedicine-prohealth/premedicine/medical-school-acceptance.php>).

## Certificate Offered

- Premedicine, Certificate (<https://catalogs.northwestern.edu/sps/certificates/post-baccalaureate/premedicine/premedicine-certificate/>)

## Premedicine Courses

### BIOL\_SCI 201-CN Molecular Biology (1 Unit)

Basics of molecular biology, including the structure of macromolecules, DNA replication, transcription, and translation and the mechanisms by which these processes are regulated. Current biotechnology methods used to study molecular biology. Credit not allowed for both BIOL\_SCI 201-CN and BIOL\_SCI 215-CN.

### BIOL\_SCI 202-CN Cell Biology (1 Unit)

How an evolutionary perspective informs our understanding of human anatomy, health and disease. Mechanisms the cell uses to compartmentalize and transport proteins, to move, to regulate growth and death, and to communicate with their environments.

**Prerequisite:** Students must have completed, with a C- or better, BIOL\_SCI 201-CN or 215-CN to register for this course. Should be taken concurrently with BIOL\_SCI 232-CN. Credit not allowed for both BIOL\_SCI 219-CN and BIOL\_SCI 202-CN.

### BIOL\_SCI 203-CN Genetics and Evolution (1 Unit)

Fundamentals of genetics and evolution. From the rules of heredity to the complex genetics of humans, the methods and logic of genetics as applied to inheritance, development, neurobiology, and populations. The process and tempo of evolution, from natural selection to speciation, emphasizing how genetics plays a critical role.

**Prerequisite:** Students must have completed, with a C- or better, BIOL\_SCI 202-CN or BIOL\_SCI 219-CN to register for this course.

### BIOL\_SCI 232-CN Molecular and Cellular Processes Laboratory (0.34 Unit)

Laboratory techniques and experience that investigates relevant scientific research and teaches scientific inquiry skills such as experimental design, writing research proposals, data collection, data analysis/interpretation, and the presentation of results. The experimental model revolves around atherosclerosis and macrophage phagocytosis of apoptotic cells. Various cell and molecular biology techniques. Should be taken concurrently with BIOL\_SCI 202-CN. Credit not allowed for both BIOL\_SCI 221-CN and BIOL\_SCI 232-CN.

### BIOL\_SCI 233-CN Genetics and Molecular Processes Laboratory (0.34 Unit)

Laboratory techniques and experience that investigates relevant scientific research and teaches scientific inquiry skills such as experimental design, writing research proposals, data collection, data analysis/interpretation, and the presentation of results. The experimental model revolves around aggregate prone proteins in nematodes and RNA interference (RNAi) affecting protein folding and the clearance of protein aggregates. Various cell and molecular biology techniques.

**Prerequisite:** Students must have completed BIOL\_SCI 232-CN. Credit not allowed for both BIOL\_SCI 220-CN and BIOL\_SCI 233-CN.

#### **BIOL\_SCI 234-CN Investigative Laboratory (0.34 Unit)**

##### **BIOL\_SCI 308-CN Biochemistry (1 Unit)**

Basic concepts in biochemistry, emphasizing the structure and function of biological macromolecules, fundamental cellular biochemical processes, and the chemical logic in metabolic transformations.

**Prerequisite:** BIOL\_SCI 217-CN and CHEM 210-A.

##### **CHEM 110-CN Quantitative Problem Solving in Chemistry (1 Unit)**

Solution strategies for traditional word problems and their application to basic chemistry quantitative problems: dimensional analysis, chemical equations, stoichiometry, limiting reagents.

##### **CHEM 131-CN Fundamentals of Chemistry I (1 Unit)**

Quantum mechanics, electronic structure, periodic properties of the elements, chemical bonding, thermodynamics, intermolecular forces, properties of solids and liquids, special topics in modern chemistry. Must be taken concurrently with CHEM 141-CN.

**Prerequisite:** grade of C- or higher in CHEM 110-CN.

##### **CHEM 132-CN Fundamentals of Chemistry II (1 Unit)**

Solutions and colligative properties, chemical equilibrium, aqueous solution equilibria, chemical kinetics, metals in chemistry and biology, oxidation-reduction reactions and electrochemistry, special topics in modern chemistry. Must be taken concurrently with CHEM 142-CN.

**Prerequisite:** grade of C- or higher in CHEM 131-CN and CHEM 141-CN.

##### **CHEM 141-CN Fundamentals of Chemistry Laboratory I (0.34 Unit)**

Chemical analysis of real samples using basic laboratory techniques including titration, colorimetric analysis, density measurements, and atomic spectroscopy. Planning, data collection, interpretation, and reporting on experiments. Credit for this course is 0.34 units. Must be taken concurrently with CHEM 131-CN.

**Prerequisite:** grade of C- or higher in CHEM 110-CN.

##### **CHEM 142-CN Fundamentals of Chemistry Laboratory II (0.34 Unit)**

Chemistry laboratory techniques applied to materials science and nanotechnology, acid-base chemistry, and chemical kinetics. Planning, data collection, interpretation, and reporting on experiments. The course must be taken concurrently with CHEM 132-CN. Credit for this course is 0.34 units.

**Prerequisite:** grade of C- or higher in CHEM 131-CN.

##### **CHEM 215-A Organic Chemistry I (1 Unit)**

Foundational concepts in organic chemistry will be introduced. Topics include structure and properties of common functional groups, acidity/basicity, conformational analysis, stereochemistry, and reactivity of organic compounds. The chemistry of hydrocarbons, alkyl halides, and alcohols, ethers, and carbonyl compounds included.

**Prerequisite:** CHEM 132-CN and CHEM 142-CN (C- or better in all listed courses) or permission of department by placement exam. Must be taken concurrently with CHEM 235-A.

##### **CHEM 215-B Organic Chemistry II (1 Unit)**

Fundamental concepts in organic chemistry will be covered. Topics include important functional groups: nomenclature, structure, properties, and multi-step synthesis. Reaction mechanisms for organic

transformations presented, and synthesis strategies covered. The chemistry of pi systems and aromatic ring system, amines, and carboxylic acids and their derivatives, and enol/enolate species included.

**Prerequisite:** CHEM 215-A and CHEM 235-A (C- or better). Must be taken concurrently with CHEM 235-B.

##### **CHEM 235-A Organic Chemistry Lab I (0.34 Unit)**

Standard laboratory techniques in organic chemistry will be covered.

Techniques will focus on the isolation and purification of organic compounds as well as the use of spectroscopic methods to determine identity and purity.

**Prerequisite:** CHEM 132-CN and CHEM 142-CN (C- or better in all listed courses) or permission of department by placement exam. Must be taken concurrently with CHEM 215-A.

##### **CHEM 235-B Organic Chemistry Lab II (0.34 Unit)**

Complete laboratory experiments focusing on standard synthetic organic chemistry conducted each week. Students complete prelab worksheet including stoichiometric calculations, prediction of reaction outcome, and identification of safety protocols.

**Prerequisite:** CHEM 215-A and CHEM 235-A (C- or better). Must be taken concurrently with CHEM 215-B.

##### **PHYSICS 130-A College Physics I (1 Unit)**

First quarter of a three-quarter algebra-based physics course with lecture and laboratory. Physics is the most basic of the sciences, dealing with the behavior and structure of matter. Lectures and labs illustrate physical principles: mechanics, motion, momentum and energy, and fluids.

Continues in winter and spring quarters as PHYSICS 130-B, PHYSICS 130-C. Must be taken concurrently with PHYSICS 131-A lab.

**Prerequisite:** college algebra or higher college math course.

##### **PHYSICS 130-B College Physics II (1 Unit)**

Continuation of PHYSICS 130-A algebra-based physics with lecture and laboratory; the sequence concludes with PHYSICS 130-C in the spring quarter. Harnessing the forces of electrical power; how they have altered the way we live and perceive ourselves in the universe. Lecture demonstrations illustrate physical principles: electricity and magnetism, DC and AC circuits. Must be taken concurrently with PHYSICS 131-B lab.

**Prerequisite:** PHYSICS 130-A or equivalent course.

##### **PHYSICS 130-C College Physics III (1 Unit)**

Continuation of PHYSICS 130-A, PHYSICS 130-B. Wave motion, optics, and introduction to the basic concepts of modern physics including quantum mechanics, relativity, and atomic physics. Focus on conceptual understanding of basic physical principles and their real-world applications. Demonstration experiments will be used to illustrate physical phenomena and concepts. Must be taken concurrently with PHYSICS 131-C lab.

**Prerequisite:** PHYSICS 130-A, PHYSICS 130-B or equivalent course.

##### **PHYSICS 131-A Physics Laboratory I (0.34 Unit)**

Laboratory course associated with PHYSICS 130-A; must be taken concurrently. Credit for this course is .34 units.

##### **PHYSICS 131-B Physics Laboratory II (0.34 Unit)**

Laboratory course associated with PHYSICS 130-B; must be taken concurrently. Credit for this course is .34 units.

##### **PHYSICS 131-C Physics Laboratory III (0.34 Unit)**

Laboratory course associated with PHYSICS 130-C; must be taken concurrently. Credit for this course is .34 units.

##### **PRO\_HLTH 396-A Professional Health Careers Proseminar I (0 Unit)**

Noncredit proseminar for students in professional health certificate programs. Prepares students to succeed in the professional health careers program. Topics include: adjusting to life as a science student,

academic resources, extracurricular resources, and preparing for the professional/medical school application process. Enrollment by permission; open only to students in a professional health careers certificate program.

**PRO\_HLTH 396-B Professional Health Careers Proseminar II (0 Unit)**

Noncredit proseminar for students in professional health certificate programs. Prepares students for the year-long application cycle beginning in the summer, providing opportunities to work on major application components, including their AMCAS activities listing, a strong personal statement, selecting target medical/professional schools, and navigating the centralized application. Practice for interviews, glide year planning. Enrollment by permission; open only to students in a professional health careers certificate program.

**BIOL\_SCI 310-CN Human Physiology (1 Unit)**

An exploration of the functions of the human body at the tissue, organ, and organ system level. Emphasis on homeostatic mechanisms and interdependence within organs and organ systems and the influence of modulatory systems. Topics will include, but are not limited to: nervous, cardiovascular, respiratory, and renal systems.

**CHEM 215-C Organic Chemistry III (1 Unit)**

Advanced concepts in modern organic chemistry introduced. Focus on recent developments in synthetic organic chemistry, including concerted/pericyclic reactions, catalysis, green/environmental chemistry, automated synthesis, and combinatorial/screening methods. Additional topics include an introduction to materials and polymer chemistry.

**Prerequisite:** CHEM 215-B and CHEM 235-B (C– or better). Must be taken concurrently with CHEM 235-C.

**CHEM 235-C Organic Chemistry Lab III (0.34 Unit)**

Advanced concepts in modern organic chemistry introduced. Focus on recent developments in synthetic organic chemistry, including: concerted/pericyclic reactions, catalysis, green/environmental chemistry, automated synthesis, and combinatorial/screening methods. Additional topics include an introduction to materials and polymer chemistry.

**Prerequisite:** CHEM 215-B and CHEM 235-B (C– or better). Must be taken concurrently with CHEM 215-C.

**KINS 237-CN Foundations of Human Movement (1 Unit)**

An introductory course examining the biomechanical and physiological factors contributing to the control of human movement. This course concentrates on the biomechanical principles of the musculoskeletal system and how these principles impact global human movements as well as joint-specific movement. It will also encompass the foundational physiology of muscle tissue and how it facilitates movement about a joint. Learning experiences will include self-paced online modules, in-person lectures, laboratories, and task analysis activities to foster the ability to comprehend the foundational principles that drive human movement.

**PSYCH 110-CN Introduction to Psychology (1 Unit)**

A survey course reviewing primary psychological research and theories of human behavior. Carries social science credit.

**STAT 202-DL Introduction to Statistics and Data Science (1 Unit)**

This course provides an introduction to the basic concepts of statistics. Throughout the course, students will learn to: summarize data using graphs and tables; explain/calculate descriptive statistics, confidence intervals, correlation, regression, and probability; and explain tests of significance and data-production including sampling and experiments. Basic knowledge of algebra is recommended.

**MATH 220-A Single-Variable Differential Calculus (1 Unit)**

Limits. Differentiation. Linear approximation and related rates. Extreme value theorem, mean value theorem, and curve-sketching. Optimization.

**MATH 220-A-DL Single-Variable Differential Calculus (1 Unit)**

Limits, Differentiation. Linear approximation and related rates. Extreme value theorem, mean value theorem, and curve-sketching. Optimization.

**MATH 220-B Single-Variable Integral Calculus (1 Unit)**

Definite integrals, antiderivatives, and the fundamental theorem of calculus. Transcendental and inverse functions. Areas and volumes. Techniques of integration, numerical integration, and improper integrals. First-order linear and separable ordinary differential equations.

**Prerequisite:** MATH 220-A.

**MATH 220-B-DL Single-Variable Integral Calculus (1 Unit)**

Definite integrals, antiderivatives, and the fundamental theorem of calculus. Transcendental and inverse functions. Areas and volumes. Techniques of integration, numerical integration, and improper integrals. First-order linear and separable ordinary differential equations.

**Prerequisite:** MATH 220-A, MATH 220-A-DL.

**ENGLISH 111-DL Writing Seminar II (1 Unit)**

Topics vary. TBD.

**ENGLISH 205-DL Intermediate Composition (1 Unit)**

Expository writing at an intermediate level. Emphasis on techniques for writing clearly, precisely, and persuasively. May be repeated for credit with different topic.