

The First Year of Studies

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All students admitted to Notre Dame as undergraduate first-year students enter the First Year of Studies. The responsibilities of the First Year of Studies are to arrange the academic programs for the first-year students and to provide the guidance needed as they adjust to their new environment and meet the challenges of the Notre Dame Academic Program.

The academic program for each first-year student is constructed around a framework called the First-Year Curriculum. The First-Year Curriculum includes five courses plus physical education or ROTC each semester. Seven of the 10 courses are in specified areas and three are electives. This arrangement provides two of the most important features of an academic program for first-year students: (1) a foundation in liberal education and (2) an opportunity to sample areas before declaring a major.

At Notre Dame, no first-year student is in a major. In the First-Year Curriculum, all students are given the opportunity to sample areas before they are required to declare a commitment to any one of them.

Because of the specific requirements within the First-Year Curriculum, students gain a broad overview of academic areas. The options and electives found within the curriculum provide the opportunity to explore areas of interest open to them.

The First Year of Studies advisors provide information regarding the First-Year Curriculum and its relation to further education and life goals. The advisors also assist the first-year students as they plan their first year at Notre Dame and assist in the transition into the sophomore year.

Upon successful completion of the First-Year Curriculum, Notre Dame students advance from the First Year of Studies to one of four undergraduate colleges: Arts and Letters, Business, Engineering, or Science, or the School of Architecture.

First-Year Curriculum

The First-Year Curriculum consists of five courses plus physical education or ROTC each semester. The five courses are arranged as follows:

Course 1

1 semester of a University Seminar

and

1 semester of Composition

Course 2

2 semester courses in mathematics

Course 3

2 semester courses in a natural science

Course 4

1 semester course of an Arts and Letters

University requirement chosen from:

history, social science, philosophy, theology or fine arts

and

1 semester elective course

Course 5

2 semester courses of University or program requirements

Entering students are expected to take the entire First-Year Curriculum of five courses per semester, along with the laboratories and tutorials that accompany those courses, plus physical education or ROTC. It is possible to take an activity or experiential learning one-credit course, such as chapel choir, chorale, chorus, glee club, marching band, orchestra, and other music ensembles. The colleges will have restrictions on how many one-credit voluntary courses may be applied to the total number of credits required for graduation from the colleges.

Certain courses and course areas in the First-Year Curriculum are included among the University requirements for all undergraduate students at Notre Dame. These courses and course areas are: a University Seminar; Composition; two semester courses in mathematics; two semester courses in a natural science; one semester course chosen from history, social science, philosophy, theology, fine arts; and two semester courses in physical education or in ROTC. Foreign language is not a University requirement, but it is required in the programs of the College of Arts and Letters and the College of Science.

In addition to these courses and course areas, the First-Year Curriculum includes three semester elective courses that may be used to sample particular areas of focused education or to further general education. To aid in the sampling, we recommend specific courses as the best preparation for certain of the college programs. General recommendations concerning each of the courses in the First-Year Curriculum are given in the following pages, along with descriptions of the courses named. In addition, complete instructions for making course selections and detailed course descriptions are included in the *First Year Academic Guide*, which is mailed to all incoming freshmen during the month of June.

Course 1—A University Seminar/Composition

A University Seminar and Composition are companion courses that all Notre Dame undergraduate first-year students take as University requirement courses. Both courses, a University Seminar and First Year Composition (FYC), must be taken, one in each semester.

COURSE DESCRIPTIONS

University Seminar

University Seminars are designed to foster intense interaction between first-year students and faculty in small settings. These courses are offered by every department (except computer applications) within the College of Arts and Letters and will satisfy the relevant University requirement in history, literature, fine arts, and social science, and the first course of the philosophy or theology requirement. These seminars include a significant writing component and require a minimum of 24 pages with at least one rewrite of a corrected paper. Each first-year student will be required to complete one University Seminar.

FYC 13100. First-Year Composition (3-0-3)

First-Year Composition is designed to help students learn how to identify an issue amid conflicting points of view and craft an argument based on various sources of information. The course stresses the identification and analysis of potential counter-arguments and aims to develop skills for writing a research proposal, for conducting original research, and for using print and electronic resources from the library.

FYC 13200. Community-Based First-Year Composition (3-1-4)

In cooperation with the Center for Social Concerns, these sections of composition place students in learning situations in the wider community where they are in contact with people who are dealing with the specific content issue of their section. Because the necessary time commitment for these sections is greater, students are awarded an extra credit hour for their enrollment (four instead of three). We welcome students with commitment to social justice and community service and excellent time-management skills to enroll.

FYC 13300. Multimedia First-Year Composition (3-0-3)

Because researching and composing arguments is increasingly linked to technological tools, multimedia sections of First-Year Composition teach students how to make the most of a wide array of resources. From standard tools, such as Microsoft Word, to more powerful websites and software, such as the Research Assistant Hyperfolio, students in multimedia sections use composition technology to its fullest while exploring the unique opportunities

and challenges of composing in the 21st century. Thus, students in these sections learn both composition and technological skills they can apply to other courses and fields. While students do not need any prior technological skills, they should be ready to learn many of these skills over the course of the semester. Students will be required to bring a wireless laptop to class and to keep their laptops functioning properly throughout the semester.

FYC 13400. Advanced First-Year Composition (3-0-3)

Advanced First-Year Composition is a writing workshop designed as an elective for students who have advanced placement credit for First-Year Composition but who seek opportunities to enhance their academic writing skills. Space is limited.

FYC 13500. Advanced First-Year Multimedia Composition (3-0-3)

Advanced First-Year Multimedia Composition is a writing workshop designed as elective for students who have advanced placement credit for First-Year Composition but who seek opportunities to enhance their academic writing skills and the related technological skills outlined in the course description for FYC 13300. Space is limited.

Course 2—Mathematics

All Notre Dame first-year students must take two semesters of mathematics as a University requirement. Note the special sequencing of the two semesters of mathematics. Students who have credit for the first level of calculus (whether MATH 10250, 10350, 10550, or 10850) will not fulfill the University requirement unless they take a second level of calculus (MATH 10260, 10360, 10560, or 10860) or MATH 10120, or a non-calculus course chosen from MATH 10130–10190.

Students in the College of Arts and Letters may fulfill their mathematics requirement by taking any of the calculus sequences required of students in other colleges or the School of Architecture. The only exceptions are for the arts and letters preprofessional (premedical) and math major programs (as noted below under MATH 10350–10360 and MATH 10850–10860). Additionally, there are other mathematics courses specially designed for students in this college. These include Finite Mathematics (MATH 10120) and courses chosen from the grouping MATH 10130–10240.

For students in the Mendoza College of Business, the required calculus sequence is MATH 10250, 10260. Also acceptable are the calculus sequences required of students in the College of Engineering or the College of Science.

Students in the School of Architecture take MATH 10250, 10270. Also acceptable are the calculus sequences MATH 10250, 10260; or the calculus sequences required of students in the College of Engineering or the College of Science.

Students majoring in the College of Science will fulfill their University mathematics requirement through one of the following calculus sequences: MATH 110350–10360, MATH 110550–10560, MATH 110850–10860, or MATH 10450–10460. The sequences MATH 10350–10360 and MATH 10450–10460 are acceptable for students in certain programs emphasizing the life sciences, such as biological sciences, or the preprofessional programs in either the College of Science or the College of Arts and Letters. For students in the College of Engineering, the mathematics requirement is fulfilled through the calculus sequence MATH 10550–10560 or MATH 10850–10860.

The sequence MATH 10850–10860, which is a more rigorous course, is designed especially for students who plan to enter either the Honors Mathematics sequence in the College of Science or the Mathematics Major in the College of Arts and Letters. It is also open to other students with strong high school mathematics backgrounds who desire a greater intellectual challenge and a deeper insight into the calculus than is offered by the other calculus sequences. The course stresses concepts and proofs.

A student who completes the MATH 10250, 10260 or 10250, 10270 sequences and then decides to enter a science or engineering program will have to take additional courses in mathematics, as prescribed by the administrator of the program.

Students planning to major in biochemistry must take MATH 10550–10560. Students planning to enter other science programs that require only two semesters of calculus also may use MATH 10350–10360 to satisfy the requirement, but they should be aware that it is not a suitable Prerequisite for the sophomore sequence MATH 20550, 20580, or 20550.

COURSE DESCRIPTIONS

MATH 10110. Principles of Finite Mathematics (3-0-3)

For students in arts and letters. For first-year students who lack the necessary background for MATH 10120. (Students who take this course cannot take MATH 10120). Topics include the fundamental principles of counting systematically, probability, statistics, linear programming, optimization problems, game theory and mathematical finance, population problems, and coding information. There is a wealth of applications of these topics to contemporary social, economic, and political issues appealing to liberal arts students. Also, these topics broaden a student's mathematical horizon in an interesting direction not covered by calculus, which deals mostly with continuous models.

MATH 10120. Finite Mathematics (3-0-3)

For students in arts and letters or as an elective for students in business administration. Topics include the fundamental principles of counting systematically, probability, statistics, linear programming, optimization problems, game theory, and mathematical

finance. Other topics that may be covered include population problems, difference equations and modeling, and coding information. There is a wealth of applications of these topics to contemporary social, economic, and political issues appealing to liberal arts students. Also, these topics broaden a student's mathematical horizon in an interesting direction not covered by calculus, which deals mostly with continuous models.

MATH 10130. Beginning Logic (3-0-3)

For students in arts and letters. Provide the students with some formal tools for analyzing arguments. By writing proofs in a formal system, students see the importance of stating the basic premises in an argument and giving intermediate steps that lead to the conclusion. They learn strategies for thinking up proofs. They see that proof checking is, in principle, something that a machine could do. Students learn truth tables and see an effective procedure that they could apply to any argument stated in propositional logic, to determine whether the conclusion follows logically from the premises. There is nothing like truth tables for predicate logic. Students get to experience doing what mathematicians do, trying to determine whether a particular conclusion follows from some premises by searching simultaneously for a proof or a counterexample. Writing papers gives students an opportunity to explore other topics in logic of their interest.

MATH 10140. Elements of Statistics (3-0-3)

This course is aimed to those students who may or may not plan to use statistics in their chosen careers, but wish nevertheless to become informed and astute consumers. Topics include: statistical decision making, sampling, data representation, random variables, least square regression lines, elementary probability theory, conditional probabilities, independence, and Bayes' rule. The methodology will focus on a "hands-on" approach, with use of computer simulation and representation. Concepts and terminology will be introduced only after thorough exposure to situations that necessitate the concepts and terms. Care will be exercised to select a variety of situations from the many fields where statistics are used in modern society. Examples will be taken from biology and medicine (e.g., drug testing, wild animal counts), the social sciences, psychology, and economics.

MATH 10240. Principles of Calculus (3-0-3)

For students in arts and letters. Note: Credit is not given for both this course and any other calculus course. A terminal course introducing the principles of calculus. Topics include basic properties of functions, derivatives and integrals, with interesting real-life applications throughout. This course is not intended to prepare students for more advanced work in calculus.

MATH 10250. Elements of Calculus I
(3-0-3)

For students in arts and letters, architecture, or business. A study of basic calculus as part of a liberal education. It emphasizes conceptual learning and stresses the connections between mathematics and modern society. Topics include functions, limits, derivatives, and an introduction to integral, with interesting real-life applications throughout. Students are familiarized with the many different interpretations of the derivative as a rate of change, and the integral as a total rate of change. This enables them to learn and practice modeling in a variety of situations from economics to the social and the life sciences.

MATH 10260. Elements of Calculus II for Business
(3-0-3)

Prerequisite(s): MATH 10250 or MATH 10350 or MATH 10550 or MATH 10850
Credit is not given for both MATH 10280 and either of the following courses: MATH 10260 and MATH 10360. For students in business. An introduction to mathematical concepts, techniques, and ideas that are useful in understanding and solving problems that arise in economics and business. Most mathematical concepts are introduced through business problems. Furthermore, by using available computer technology, real-life problems, that may lead to non-trivial computations and graphics are considered. Topics include integration, differential equations, Taylor polynomial approximations, unconstrained and constrained optimization for functions of several variables, probability and statistics, with real-life applications throughout.

MATH 10270. Elementary Calculus in Action
(3-0-3)

Prerequisite(s): MATH 10250 or MATH 10550 or MATH 10850

A second calculus course for arts and letters and architecture students. This course uses typical mathematical strategies of elementary calculus and shows these "in action" with studies of the suspension bridge, various nuclear clocks, growth patterns of human and bacterial populations, the dynamics of money, and basic economics.

MATH 10350. Calculus A
(3-1-4)

Corequisite(s): MATH 12350

Primarily for students in science whose programs require a one-year terminal course in calculus of one variable but also open to students in arts and letters. Topics include sets, functions, limits, continuity, derivatives, integrals, and applications.

MATH 10360. Calculus B
(3-1-4)

Prerequisite(s): MATH 10350 or MATH 10550 or MATH 10850

Corequisite(s): MATH 12360

Primarily for students in science whose programs require a one-year terminal course in calculus of one variable but also open to students in arts and letters.

Topics include sets, functions, limits, continuity, derivatives, integrals, and applications.

MATH 10550. Calculus I
(3-1-4)

Corequisite(s): MATH 12550

For students in science and engineering. Topics include sets, functions, limits, continuity, derivatives, integrals, and applications. Also covered are transcendental functions and their inverses, infinite sequences and series, parameterized curves in the plane, and polar coordinates.

MATH 10560. Calculus II
(3-1-4)

Prerequisite(s): MATH 10550 or MATH 10850

Corequisite(s): MATH 12560

For students in science and engineering. Topics include sets, functions, limits, continuity, derivatives, integrals, and applications. Also covered are transcendental functions and their inverses, infinite sequences and series, parameterized curves in the plane, and polar coordinates.

MATH 10850. Honors Calculus I
(4-0-4)

Corequisite(s): MATH 12850

Required of honors mathematics majors. A rigorous course in differential and integral calculus of one variable. Topics include an axiomatic formulation of the real numbers, mathematical induction, infima and suprema, functions, continuity, derivatives, integrals, infinite sequences and series, transcendental functions and their inverses, and applications. The course stresses careful mathematical definitions and emphasizes the proofs of the standard theorems of the subject.

MATH 10860. Honors Calculus II
(4-0-4)

Prerequisite(s): MATH 10850

Corequisite(s): MATH 12860

Required of honors mathematics majors. A rigorous course in differential and integral calculus of one variable. Topics include an axiomatic formulation of the real numbers, mathematical induction, infima and suprema, functions, continuity, derivatives, integrals, infinite sequences and series, transcendental functions and their inverses, and applications. The course stresses careful mathematical definitions and emphasizes the proofs of the standard theorems of the subject.

Course 3— Natural Science

First-year students usually take two semesters of a natural science as Course 3 in the First-Year Curriculum.

While determining which course you will take as Course 3, you should consider the following:

1. All Notre Dame students must, as a University requirement, take two semesters of a natural science before completion of their sophomore year. However, it

is recommended that the natural science requirement be met in the first year. Students planning to participate in an international study program during their sophomore year must complete the natural science requirement in the first year, along with the required language for international study (see Course 5).

2. Students contemplating any of the College of Engineering or College of Science programs or preprofessional studies (premedical and other health-related fields) in the College of Arts and Letters take the natural science requirement in their first year.

The natural science is often a prerequisite for other courses in these programs. Students thinking of entering any of the following programs in the College of Science are advised to take CHEM 10113–10114 or CHEM 10117–10118 as their natural science requirement in the first year: environmental sciences, science preprofessional, science collegiate sequences, biological sciences, mathematics, and physics. Chemistry and biochemistry majors take CHEM 10181 or CHEM 10113. A second science course is required and discussed under Course 5 for students interested in chemistry, biochemistry, biological sciences, environmental sciences, mathematics, and physics. Students planning to enter the College of Arts and Letters Preprofessional Program will also take CHEM 10113–10114 or CHEM 10117–10118 in their first year.

3. Students planning on an engineering program are required to take CHEM 10113–10114 or CHEM 10121–10122 as the sequence to satisfy the requirement. The correct option is determined by criteria described in the *First Year of Studies Academic Guide*.

4. Prospective arts and letters or business students interested in the environmental sciences second major offered by the College of Science should take CHEM 10113–10114 or CHEM 10117–10118 as their natural science requirement.

5. Students planning to enter the Mendoza College of Business programs or the College of Arts and Letters programs other than mathematics or preprofessional studies may select freely from among any of the natural science courses offered and for which they are prepared. However, the following courses are specially designed for the students planning to enter these programs: BIOS 10101 through 10117; CHEM 10101 through 10104; PHYS 10011, 10012, 10140, 10111, 10122, 10240, 10262; SCPP 10101.

6. First-year students may substitute two semesters of a foreign language in place of two semesters of science to complete their first-year course requirements. (Refer to Course 5 for information on foreign language.)

COURSE DESCRIPTIONS

Series I—Laboratory Sciences

The courses offered by the College of Science for first-year students are broadly grouped into two main categories. The first series of courses, Laboratory Sciences, are listed below. They are intended for students who are planning to major in one of the sciences or in engineering or perhaps would prefer an in-depth discussion of a particular field of study.

BIOS 10161. Biological Sciences I—Lecture and Laboratory (4-0-4)

This is a two-semester course with three lectures and one three-hour laboratory a week for first-year students contemplating a career in biology, medicine, or related areas of life science. The first semester presents a description of biologically important molecules and then proceeds to cell structure, energy metabolism, and classical and modern genetics.

The topics presented in the second semester in the context of modern evolutionary theory include biological diversity, ecology, and organismal physiology. BIOS 10161 and 10162 are not typical survey courses; they go into greater depth, especially in modern molecular biology. When followed by BIOS 20241 and BIOS 20250, they will provide biology and biochemistry majors, including premedical intents, with a thorough in-depth overview of basic concepts of modern biology.

CHEM 10113. General Chemistry I-T Lecture, Tutorial, and Laboratory (4-0-4)

Corequisite(s): CHEM 11113, CHEM 12113
Introduction to the principles and concepts of chemistry and its application in the world. Topics include periodic properties of the elements, reaction stoichiometry, atomic theory, molecular structure and bonding, acids and bases, reduction-oxidation reactions, gas-laws, thermochemistry, equilibrium, and chemical kinetics. Lectures, demonstrations, laboratory experiments, and tutorial sections are integrated to promote a deeper understanding of chemistry fundamentals and to develop the analytical skills necessary for solving problems. In the weekly tutorials, students work in small groups at solving problems collaboratively. The general topics, textbook, and laboratory are the same as those for CHEM 10117–10118. CHEM 10113 will serve as a prerequisite course to all upper-level courses that list CHEM 10117 or CHEM 10125 as a prerequisite.

CHEM 10114. General Chemistry II-T Lecture, Tutorial, and Laboratory (4-0-4)

Prerequisite(s): CHEM 10113 or CHEM 10121
Introduction to the principles and concepts of chemistry and its application in the world. Topics include periodic properties of the elements, reaction stoichiometry, atomic theory, molecular structure and bonding, acids and bases, reduction-oxidation reactions, gas-laws, thermochemistry, equilibrium, and chemical kinetics. Lectures, demonstrations,

laboratory experiments, and tutorial sections are integrated to promote a deeper understanding of chemistry fundamentals and to develop the analytical skills necessary for solving problems. In the weekly tutorials, students work in small groups at solving problems collaboratively. The general topics, textbook and laboratory are the same as those for CHEM 10117–10118. CHEM 10114 will serve as a prerequisite course to all upper-level courses that list CHEM 10118 or CHEM 10126 as a prerequisite.

CHEM 10117. General Chemistry I Lecture and Laboratory (4-0-4)

Corequisite(s): CHEM 11117
Designed for first-year students intending to major in science and engineering. This lecture course covers classical/modern chemistry, with applications, in the approximate order: stoichiometry and classical atomic theory of chemistry; periodic properties; gas laws; chemical equilibrium; solution chemistry (acids and bases, solubility, physical properties of solution); thermochemistry; chemical kinetics; modern quantum theory of atomic and molecular structure and periodic properties. Descriptive chemistry is included throughout in all developments. Frequent live demonstrations and classroom computer use emphasize the unifying experimental and theoretical aspects of the subject.

CHEM 10118. General Chemistry II Lecture and Laboratory (4-0-4)

Prerequisite(s): CHEM 10115 or CHEM 10117 or CHEM 10121
Corequisite(s): CHEM 11118
The second semester of general chemistry. Designed for first-year students intending to major in science and engineering. This lecture course covers classical/modern chemistry, with applications, in the approximate order: stoichiometry and classical atomic theory of chemistry; periodic properties; gas laws; chemical equilibrium; solution chemistry (acids and bases, solubility, physical properties of solution); thermochemistry; chemical kinetics; modern quantum theory of atomic and molecular structure and periodic properties. Descriptive chemistry is included throughout in all developments. Frequent live demonstrations and classroom computer use emphasize the unifying experimental and theoretical aspects of the subject.

CHEM 10121. General Chemistry: Fundamental Principles and Biological Processes (4-0-4)

Corequisite(s): CHEM 11121
Designed for first-year students intending to major in engineering. In the first semester, the fundamental principles of chemistry are presented including atomic and molecular structure, molecular properties, periodic trends in reactivity, solution chemistry, thermodynamics, and kinetics. Quantitative aspects are stressed. A laboratory is offered with this part of the course. In the second semester, these topics are woven into key themes of modern biology, includ-

ing protein structure and function, gene structure and manipulation, and basics of biotechnology. Emphasis is placed on common themes rather than biological details, and examples are drawn from biological systems of interest to engineers. This course will serve as a prerequisite course to all upper-level courses that list CHEM 10118 or CHEM 10181 as a prerequisite.

CHEM 10122. General Chemistry: Fundamental Principles and Biological Processes

(3-0-3)

Prerequisite(s): CHEM 10121

Designed for first-year students intending to major in engineering. In the first semester, the fundamental principles of chemistry are presented, including atomic and molecular structure, molecular properties, periodic trends in reactivity, solution chemistry, thermodynamics and kinetics. Quantitative aspects are stressed. A laboratory is offered with this part of the course. In the second semester, these topics are woven into key themes of modern biology, including protein structure and function, gene structure and manipulation, and basics of biotechnology. Emphasis is placed on common themes rather than biological details, and examples are drawn from biological systems of interest to engineers. This course will serve as a prerequisite course to all upper-level courses that list CHEM 10118 or CHEM 10181 as a prerequisite.

CHEM 10181. Introduction to Chemical Principles—Lecture, Tutorial, and Laboratory (4-0-4)

Corequisite(s): CHEM 11181, CHEM 12181, MATH 10550

This course provides a thorough grounding in the fundamental principles governing chemical structure and reactivity. Topics to be discussed include the quantum mechanical structure of atoms, models of chemical bonding, chemical equilibrium, acidity and basicity, and thermochemistry and thermodynamics. Recommended for students with a special interest in the subject, especially those intending to major in chemistry or biochemistry. Lectures will be supplemented with a weekly tutorial session.

CHEM 10182. Organic Structure and Mechanism—Lecture, Tutorial, and Laboratory (4-0-3)

Prerequisite(s): CHEM 10181 and MATH 10550
Corequisite(s): CHEM 10182 and MATH 10560

A thorough treatment of the basic principles of organic chemistry, including fundamental aspects of organic and biological structures and bonding, and the effect of structure on physical and chemical properties. A detailed analysis of organic chemical reactivity including reactive intermediates, mechanistic principles, and the applications of reactions in synthesis. Lectures will be supplemented with a weekly tutorial session.

ENVG 10110. Physical Geology—Lecture and Laboratory
(3-2-4)

Corequisite(s): ENVG 11110

An introduction to the Earth and its processes, composition, evolution, and structure. The course introduces the student to mineralogy, petrology, structural geology, oceanography, surficial processes, geophysics, environmental geology, and planetology. Open to engineering and science core intents.

PHYS 10310. General Physics I
(4-0-4)

Prerequisite(s): MATH 10550, MATH 10850

Corequisite(s): PHYS 11310, PHYS 12310, MATH 10550, or MATH 10850

The first course in a two-semester sequence in general physics. Topics include the kinematics and mechanics of a particle; work, energy and momentum, and associated conservation laws; rotation, torque and angular momentum; oscillations and wave motions. A course designed for students of science and engineering. Laboratory meetings in alternating weeks only. Weekly tutorial sessions.

PHYS 10320. General Physics II
(3-1-4) B

Prerequisite(s): PHYS 10310, PHYS 10411, MATH 10550, MATH 10850

Corequisite(s): PHYS 11320, PHYS 12320, MATH 10560, or MATH 10860

The second course in a two-semester sequence in general physics. Topics include electro-statics, electric current, and circuits; magnetism, electromagnetic induction, and waves; and geometrical optics. A course designed for students of science and engineering. Laboratory meetings in alternating weeks only. Weekly tutorial sessions.

PHYS 10411. General Physics I-M
(4-1-4)

Corequisite(s): PHYS 11411, MATH 10550, MATH 10850

The first semester of a three-semester sequence in general physics. Topics include the kinematics and mechanics of a particle; work, energy, and momentum, and associated conservation laws; rotation, torque, and angular momentum; oscillations and wave motions. A course designed for students intending to enter the Department of Physics. Laboratory meetings each week.

Series II—Topical Sciences

The second series of courses, Series II, Topical Sciences, is designed for those first-year students who are planning eventually to enter the College of Arts and Letters, the Mendoza College of Business, or the School of Architecture. These courses differ from the courses noted above chiefly in that they are somewhat interdisciplinary in nature and/or that they focus on themes that may have, in part, an ethical or value-related dimension. It should be emphasized that these courses are often just as rigorous and intellectually demanding as the laboratory courses offered by the college.

BIOS 10101. Human Genetics, Evolution, and Society
(3-0-3)

Corequisite(s): BIOS 12101

This course will address fundamental biological principles using the two cornerstones of modern biology: genetics and evolution. Elementary chemistry, cell theory, reproduction, and development will also be covered. The emphasis, however, will be on human genetics and will include such topics as the cause and effects of genetic abnormalities, the genetic basis of intelligence and skin color, genes and cancer, and elementary population genetics. The state of “genetic engineering” research, the recombinant DNA controversy (including the implications of this kind of research on society and the individual) will be presented. Fall and spring.

BIOS 10106. Common Human Diseases
(3-0-3)

The goal of this course is to introduce students to diseases that may afflict them, their parents, and/or their children, as well as other health problems common to the Tropics. It will provide the student with the information necessary to understand the biology of the disease process. Fall.

BIOS 10107. Environment and Evolution
(3-0-3)

Emphasis will be placed upon today’s ecological and environmental problems and the possible effect they may have upon the future evolution of life on Earth. Topics will generally include an overview of the theory of evolution and a discussion of ecological principles as observed at the population, community, and ecosystem levels. The influence of cultural and political factors will also be discussed. Each academic year, one or more sections will be offered; some may be individually subtitled, allowing for one-time presentation of specific topics within the context of “environment and evolution” in addition to multiple-semester presentations of a specific topic (e.g., Evolutionary Ecology, Freshwater and Society, Environmental Issues and Solutions). Fall and spring.

BIOS 10108. Revolutions in Biology
(3-0-3)

The goal of this course is to teach six basic tenets of biology, the historical context for each discovery, the scientific and technical advances made, and their ethical implications. The topics will include genetics and evolution, cell biology and biochemistry, the germ theory, and ecology. A term paper is required. Summer.

BIOS 10110. Genetics, Technology, and Society
(3-0-3)

The objectives of this course are to give students an overview of human genetics and an appreciation for the relatively new field of molecular biology that is currently being used to study human genetic diseases. Genetic technologies such as cloning and manipulating genes, genetic biotechnology, gene therapy, DNA testing, and so forth will be emphasized. The ethical, social, and legal implications of

these technologies will also be covered. In addition, this course will address the role of genetics in human cancer, behavior, obesity, intelligence, and sexual orientation. Generally offered in the summer where there are five lectures per week. When offered during the academic year, there are three lectures per week.

CHEM 10101. Foundations of Chemistry
(3-0-3)

This course covers forms, properties, and separation of matter; atomic structure and periodicity; nuclear chemistry; chemical bonding and structure; reactivity with applications to acid-base and oxidation-reduction reactions; and chemistry of carbon and living systems. This course is not open to students who have taken CHEM 10103, 10115, 10113, or 10117.

CHEM 10102. Chemistry, Environment, and Energy
(3-0-3)

Chemistry of the atmosphere, hydrosphere, and lithosphere; agricultural chemistry and pesticides; food and drugs; hazardous and solid wastes; and recycling. Fossil fuels; nuclear, solar, geothermal, and other types of energy. This course is not open to students who have taken CHEM 10114, 10116, or 10118.

PHYS 10011. Concepts of Physics I
(3-0-3)

This course is intended for students who will not be majoring in science or in engineering. A study of some of the major concepts and laws of classical and modern physics, in some historical context, provides the student with a foundation for understanding, at a conceptual level, the natural phenomena and technological devices encountered in everyday experience. PHYS 10011 will include a study of motion and Newton’s laws, momentum and energy, the structure of matter, thermodynamics, and relativity. This course fulfills the University science requirement.

PHYS 10022. Concepts of Physics II
(3-0-3)

This course is intended for students who will not be majoring in science or in engineering. A study of some of the major concepts and laws of classical and modern physics, in some historical context, provides the student with a foundation for understanding, at a conceptual level, the natural phenomena and technological devices encountered in everyday experience. PHYS 10022 will cover wave motion, electromagnetism, light, and the quantum nature of the atomic and subatomic world. PHYS 10011 is not a prerequisite for PHYS 10022. This course fulfills the University science requirement.

PHYS 10052. Concepts of Energy and the Environment
(3-0-3)

A course developing the basic ideas of energy and power and their applications. The fossil fuels are considered together with their limitations, particularly as related to global warming, pollution, and their nonrenewable character. The advantages and disadvantages of nuclear power are studied and

compared with alternative energy sources such as solar energy, wind, and geothermal and hydroelectric power. Various aspects of energy storage and energy conservation are also considered. This course is designed for the non-specialist. It is open to first-year students only. It satisfies one semester of the University science requirement, but PHYS 10052 and PHYS 20051 may not both be counted toward that requirement.

PHYS 10062. Science Literacy
(3-0-3)

A course emphasizing science literacy that provides the tools for a basic understanding of scientific developments and their potential consequences. Developments in many areas of science will be discussed, including biology, chemistry, physics, astronomy, engineering, and computer science, with the view that basic physical laws serves as a common thread between them. Topics covered include the mechanisms of scientific discovery, the impact of scientific discoveries on society, science and ethics, and the tools of contemporary science. The course focuses on concepts rather than formulas and concentrates primarily on examples taken from current scientific developments. This course satisfies one semester of the University science requirement. If taken by science or engineering students, this course counts as a general elective.

PHYS 10111. Principles of Physics I
(3-0-3)

PHYS 10111 is a prerequisite to PHYS 10122. A course intended for students who desire a grounding in all the major principles of physics but who plan to major in some area other than science or engineering. The ability to apply these principles to the solution of problems is a major goal of the course. The following topics are normally included; kinematics and dynamics of a particle, work, energy, momentum, harmonic motion, gravitation, and circular orbits; wave motion, interference, standing waves, the Doppler effect; and temperature, heat, first law of thermodynamics, and kinetic theory of gases. Additional material will be at the discretion of the instructor. The division between PHYS 10111 and 10122 will depend on the order of presentation. This course fulfills the University science requirement.

PHYS 10122. Principles of Physics II
(3-0-3)

Prerequisite(s): PHYS 10111
A course intended for students who desire a grounding in all the major principles of physics but who plan to major in some area other than science or engineering. The ability to apply these principles to the solution of problems is a major goal of the course. The following topics are normally included; electric charge, Coulomb's law, electric field and potential, current, resistance, and DC circuits; magnetic force, and electromagnetic induction; the nature of light, the spectrum; photons, photoelectric effect, Compton scattering, deBroglie waves, energy levels, X-rays; nuclei and radioactivity; and special relativity. Additional material will be at the discretion of the instructor. The division between PHYS 10111 and

10122 will depend on the order of presentation. This course fulfills the University science requirement.

PHYS 10140. Descriptive Astronomy
(3-0-3)

A description of the motions and structure of the earth, moon, and planets; an exposition of the modern theories of solar and stellar structure, nebulae, and galaxies; basics of stellar evolution, black holes, quasars, and other recent developments; an introduction to cosmology. This course includes elementary observational projects. The course fulfills one semester of the University science requirement.

PHYS 10240. Elementary Cosmology
(3-0-3)

An elective course for students planning to major in the arts and letters or business. It is designed to acquaint the non-mathematically inclined student with the most important discoveries in physics of the last few decades and how they have altered our perceptions of the origin and structure of the universe. This course examines such questions as: "Where did the universe come from?" "Why do scientists feel sure that it was born in a cosmic fireball called the Big Bang?" and "Where did the Big Bang itself come from?" This is a reading-intensive course based on popularizations of science written for the curious and intelligent layperson. The emphasis will be on class discussion of the readings. One book report and a term paper are required in addition to examinations. This course satisfies one semester of the University science requirement. If taken by science students, this course counts as general elective credit.

PHYS 10262. Physical Methods in Art and Archaeology
(3-0-3)

A course that gives an overview of the various physics-based analysis and dating techniques used in art and archaeology. The course will cover topics such as X-ray fluorescence and X-ray absorption, proton-induced X-ray emission, neutron-induced activation analysis, radiocarbon dating, accelerator mass spectroscopy, luminescence dating, and methods of archeometry. Multiple examples of the use of the techniques in art and archaeology will be given, e.g., under X-ray techniques and accelerator mass spectrometry, the analysis of ancient coins and violin varnish and the Iceman and the Turin Shroud are used respectively as examples. Physics principles of the methods and techniques will be taught in a descriptive manner. This course is intended for students in arts and letters or business and satisfies one semester of the University science requirement. If taken by science or engineering students, this course counts as a general elective credit.

PHYS 10342. Modern Physics from Quarks to Quasars
(3-0-3)

Restricted to first-year arts and letters intents in the Honors Program. This course emphasizes themes of modern physics and will be organized around the concepts of symmetry and physical laws. For example, how do symmetries observed in nature lead

to fundamental laws of conservation of energy and momentum? Examples from areas of modern physics such as cosmology and astrophysics are used to bring these topics to life. We consider questions such as: "What happens if one travels alongside a beam of light?" (which leads us into special relativity); "Why is the night sky so dark?" (the Big Bang); "What is matter?"; "What is mass"; "What are forces?" The course is a mix of lecture, discussions, and lab/demonstrations.

SCPP 10101. Medical Science from Birth to Death
(3-0-3)

First-year students only. The course will give an overview of the medical science behind the technological advances used in various clinical subspecialties, advances that raise ethical questions from the beginning to the end of life. It will provide students with an overview of the biotechnological advances that are in the news, reshaping the scientific culture of modern medicine, and challenging personal and societal human values. This course fulfills one semester of the University science requirement. Fall.

Course 4— History, Philosophy, Social Science, Theology, or Fine Arts/Literature/Elective

Every Notre Dame first-year student must take at least one semester of either history, philosophy, social science, theology, or fine arts/literature as a University requirement during their first year of studies.

The courses available in the First-Year Curriculum for satisfying this requirement are listed below. Limited spaces in fine arts courses are available to first-year students. The literature requirement typically is satisfied after the first year or by taking a literature University Seminar in the first year.

COURSE DESCRIPTIONS FOR HISTORY, PHILOSOPHY, SOCIAL SCIENCE, THEOLOGY, AND FINE ARTS

History

HIST 10200. Western Civilization I
(3-0-3)

Corequisite(s): HIST 12200
A survey of the central themes in Western civilization from ancient Mesopotamia to the Renaissance. Emphasis will be on problems of social organization, especially the mutual obligations and responsibilities of individuals and states; evolving concepts of justice; aesthetic standards; religious ideas and institutions; basic philosophical concepts; different kinds of states; and the ideologies that defined and sustained them.

HIST 10400. Western Civilization II
(3-0-3)*Corequisite(s):* HIST 12400

This course will provide a comprehensive overview of European history over the last four centuries. During this period European states emerged as powerful institutions, extending their control over the peoples of Europe, and battling with each other for territory, subjects, and status, both in Europe and throughout the world. The enormous growth of state power provoked opposition from both elites and ordinary people. This course will explore resistance to the state as well as tracing its growth, with special attention paid to the English revolution in the 17th century, the French and Russian revolutions in 1789 and 1917, and the collapse of the Soviet empire in the late 20th century. Particular attention will be paid to the development of the ideologies of liberalism, socialism, and nationalism, which defined new relationships between people and their states in the 19th and 20th centuries. The changing status of women, and the emergence of feminism as another ideological alternative, will be dealt with as well. The conflicted relationship between Europe and its colonial territories will constitute another major theme.

HIST 10600. US History I: to 1877
(3-0-3)*Corequisite(s):* HIST 12600

A survey of the social, cultural, and political history of the British North American colonies and the United States to the close of the Civil War. Organized around the question of American "nationalism," topics include Native American, European, and African encounters; regional development and divergence; imperial conflict and revolution; constitutional development and argument; democratization and its implications; religious impulses and reformism; immigration and nativism; the importance of land and westward expansion; slavery and emancipation; sectional division and Civil War.

HIST 10605. US History II: from 1877
(3-0-3)*Corequisite(s):* HIST 12605

This course will be a survey of the political, diplomatic, economic, social, and cultural development of the United States from 1865, the end of the Civil War, to 1988, the end of the Ronald Reagan presidency. Major topics to be covered include post-war reconstruction, the Industrial Revolution of the late 19th century, the progressive legislation of Presidents Theodore Roosevelt and Woodrow Wilson, the causes of the Wall Street Crash and Great Depression, the New Deal programs of Franklin Roosevelt, World Wars I and II, the Fair Deal and containment policies of Harry Truman, Dwight Eisenhower's Modern Republicanism, the New Frontier of John Kennedy, Lyndon Johnson's Great Society, the civil rights and feminist movements, Vietnam, Richard Nixon and Watergate, and the presidencies of Gerald Ford, Jimmy Carter, and Ronald Reagan.

Social Sciences**ANTH 10109. Introduction to Anthropology**
(3-0-3)

This course deals with the nature of anthropology as a broad and diverse area of study. The anthropological study of humankind will be approached from the perspectives of physical anthropology; prehistory and archaeology; and linguistic anthropology and socio-cultural anthropology. The diversity of humankind will be explored in all its aspects from times past to the present.

ECON 10010. Principles of Micro Economics
(3-0-3)

An introduction to economics, with particular attention to the pricing mechanism, competitive and monopolistic markets, government regulation of the economy, labor-management relations and programs, income determination and public policy, trade and the international economy.

ECON 10020. Principles of Macroeconomics
(3-0-3)*Prerequisite(s):* ECON 10010

An introduction to economics with emphasis on national income and its determinants, fluctuations in national income, money and credit, fiscal and monetary policies, economic growth.

POLS 10100. Introduction to American Politics
(3-0-3)*Corequisite(s):* POLS 22100

This course surveys the basic institutions and practices of American politics. It examines the institutional and constitutional framework of American politics and identifies the key ideas needed to understand the subject and develop a basis for evaluating American politics today. This introductory course fulfills the American politics breadth requirement for the political science major.

POLS 10200. Introduction to International Relations
(3-0-3)*Corequisite(s):* POLS 22200

This course provides students with an understanding of historical and current events in world politics. As such, the course has three central objectives: to introduce various theoretical frameworks for analyzing international political and economic events, to provide an overview of substantive topics in international relations, and to supply a basic understanding of contemporary international events. We explore substantive issues such as cooperation and conflict in international relations, the causes of war, nuclear proliferation, regional free trade agreements, the causes and effects of economic globalization, and the role of international law and institutions. Discussion sections use historical case studies and current events to illustrate concepts introduced in lectures. This introductory course fulfills the international relations breadth requirement for the political science major.

POLS 10400. Comparative Government
(3-0-3)*Corequisite(s):* POLS 12400

This course is a general introduction to the major political institutions and conflicts that shape our world today. Rather than focusing on any particular country or time period, we will use a shocking event—the birth of the modern nation-state—to organize our thinking about a diverse range of political movements and ideologies, including feudalism, colonialism, Leninism, and liberal democracy. This introductory course fulfills the comparative politics breadth requirement for the political science major.

PSY 10000. Introductory Psychology First Year
(3-0-3)

A broad coverage of the methods and findings that characterize scientific psychology, including a description of historical and recent developments in the areas of learning and motivation; perceptual, cognitive, and physiological processes; social, personality, and child development; and abnormal behavior and clinical treatment. Open to first-year students only.

SOC 10002. Understanding Societies
(3-0-3)*Corequisite(s):* SOC 12002

This introductory course looks at how people are connected to each other through social relationships, groups, networks, and organizations. With these social connectors you will see how sociology can help answer such questions as: How are stereotypes determined? Where do our social identities come from? What do people do when they experience role conflict? Why are networks so important in the diffusion of ideas and information? What are bureaucracies and why are they so prevalent? How can I know what is of value in another culture? How do people and groups gain power over others? Are there social classes and how important are class divisions? Have race relations changed very much in the United States? When and where are women treated differently than men? How have technological changes, immigration, and social movements altered the ways in which people connect to each other?

SOC 10722. Introduction to Social Psychology
(3-0-3)

Analysis of important human processes including perceiving and knowing other people, attitudes and attitude change, conformity and nonconformity, cooperation and competition with others, leadership in groups, attraction and love, aggression and violence, prejudice. Social psychology studies how individuals and groups are influenced by other individuals and groups. In this broad introduction to social behavior, we will learn about what makes people do the things they do: What decides whom someone will fall in love with? Where do aggressive, violent, and criminal behaviors come from? Why are some people more charitable than others? Why do some people obey authority and conform while others always have to buck the trend? Why are some people lazier when they work in groups? What is the source of people's stereotypes and prejudices? How can we overcome

FIRST YEAR OF STUDIES

them? What causes conflict between groups? And finally, what makes us become who we are?

Philosophy
PHIL 10101. Introduction to Philosophy

(3-0-3)

A general introduction to philosophy, with emphasis on perennial problems such as the existence of God, human freedom, and moral obligation. The course is also intended to sharpen the student's skills of critical thinking. Satisfies the University requirement for a first course in philosophy.

Theology
THEO 10001. Foundations of Theology: Biblical/Historical

(3-0-3)

This first course in theology offers a critical study of the Bible and the early Catholic tradition. Following an introduction to the Old and New Testaments, students follow major post-biblical developments in Christian life and worship (e.g., liturgy, theology, doctrine, asceticism), emphasizing the first five centuries. For details on emphases of individual instructors, see the Department of Theology Course Description Booklet or the departmental website: www.nd.edu/~theo.

Literature
MELC 10101. Introduction to Arabic Culture and Civilization

(3-0-3)

This course is an introductory survey of Arabic culture and civilization from the pre-Islamic era to the conquest of Constantinople in 1453. The course will trace the origins of the Arab people and their distinctive culture and literature. The revelation of the Qur'an to the Prophet Muhammad and subsequent development of Islam will be treated in detail. Following this, the course will focus on the spread of Islamic civilization, its interactions with other cultures, and its contributions to scholarship in the areas of literature, art, and architecture. This course will satisfy the University literature requirement.

Fine Arts
ARST 11201. Drawing I

(3-0-3)

This course deals with form depiction in its many aspects and modes and is intended for beginning students as well as advanced students who need additional experience in drawing. Lab fee.

FTT 10101. Basics of Film and Television

(3-0-3)

Corequisite(s): FTT 11101

This course introduces students to the study of film and television, with particular emphasis on narrative. Students will learn to analyze audio-visual form, including editing, framing, *mise-en-scene*, and sound. Students will consider topics in film and television studies such as authorship, genre, stardom, and feminism. Focusing on classical Hollywood and

American TV, the course will also introduce students to international and/or alternative cinemas and television styles. Evening screenings are required. Serves as prerequisite to most upper-level courses in film and television.

FTT 10701. Introduction to Theatre

(3-0-3)

A study of theatre viewed from three perspectives: historical, literary, and contemporary production practices. Through lectures, readings, and discussion, students will study this art form and understand its relevance to their own life as well as to other art forms. A basic understanding of the history of theatre and the recognition of the duties and responsibilities of the personnel involved in producing live theatre performances will allow students to become more objective in their own theatre experiences.

MUS 10111. Introduction to Eighteenth-Century Music

(3-0-3)

Introduction to the major composers and musical genres of the 18th century. Composers studied include Vivaldi, Bach, Handel, C.P.E. Bach, Gluck, Mozart, and Haydn; musical genres studied include the cantata, concerto, sonata, fantasia, quartet, opera, and oratorio. Readings include reactions and criticisms of 18th-century listeners, and writings of modern music scholars.

MUS 10120. Introduction to Romantic Music

(3-0-3)

Music from Beethoven to Mahler. No musical background required.

MUS 10131. Introduction to Jazz

(3-0-3)

A music appreciation course requiring no musical background and no prerequisites. General coverage of the history, various styles and major performers of jazz, with an emphasis on current practice.

MUS 10132. Current Jazz

(3-0-3)

A study of the jazz performers and practices of today and of the preceding decade—the roots, stylistic developments, and directions of individual artists, small combos, and big bands.

MUS 10150. Music of the Catholic Rite

(3-0-3)

A study of the music composed for the Mass, the Office hours (primarily Vespers), and the Requiem Mass from the Middle Ages to the present day. The musical repertoire of each era is examined both from a purely musical standpoint and in light of the reactions of various popes, from John XXIII through Pius X, to the sacred music of their day. Documents on sacred music issued after Vatican II also are examined in relation to postconciliar church music for both the choir and the congregation.

MUS 10163. Gender, Race, Class, Sexuality

(3-0-3)

Owing to its reputation as the most “transcendent” and “autonomous” of all the arts, music has long been deemed “exempt” from the kinds of ideological critique applied to other modes of cultural production. In recent years, however, critics have begun to challenge the notion of autonomy in music and have attempted to demonstrate the inevitably ideological nature of all music, whether texted or not. This course adopts a cultural studies approach, focused on issues of gender, race, class, and sexuality, to the study of a wide range of both classical and popular musics, from pastourelles of the Middle Ages to music videos of Madonna, with special attention to Mozart's *Don Giovanni* and Bizet's *Carmen*. Students will learn how to listen and recognize common signifying practices adopted by composers and musicians—e.g., specific uses of melody, rhythm, meter, tempi, harmonic scales and chord progressions, dynamics, and instrumentation—and to explore critical modes of interpreting those particular musical choices within specific ideological frameworks. Intended for non-majors.

MUS 10190. Introduction to Classical Music

(3-0-3)

Historical survey of Western art music from the Middle Ages to the present, with emphasis on the study of selected significant vocal and instrumental works.

MUS 10191. Medieval and Renaissance Music (History 1)

(3-0-3)

A survey of music. The study of the major forms and styles in Western history. Required of music majors and minors, but open to students with sufficient musical background. MUS 20001 and MUS 20002 recommended before taking this class.

Electives

The first-year curriculum provides an opportunity for each first-year student to take three elective courses. Typically, these courses are used to satisfy University or intended college program requirements or to sample areas that might be of interest.

Specific recommendations for the Course 4 elective are made for only three of the intended college programs. The College of Engineering recommends that first-year students planning programs in engineering take PHYS 10310 in the spring semester as the Course 4 elective. Architecture intenders are advised to take ARCH 11021 in the spring semester, while first-year students intending the combined College of Arts and Letters-Engineering Program are advised to take PHYS 10310 in the spring semester.

COURSE DESCRIPTIONS FOR ELECTIVES

ARCH 11011. Graphics I: Drawing (3-0-3)

Instruction and practice in drawing as a means of exploring and communicating formal and theoretical concepts. Aspects of freehand drawing in pencil, charcoal, and watercolor are taught with subjects from buildings, nature, and the human figure. The course is open to all students. Studio format. Strongly recommended for those entering the architecture program. Fall.

PHYS 10310. General Physics I

For a description of this course, please see the entry under "Natural Sciences, Series I, earlier in this section of the *Bulletin*.

Course 5—University or College Requirement

The following suggestions are offered as a guide in selecting the Course 5 electives:

1. Any of the arts and letters courses listed under Course 4 may be taken as a Course 5 elective.

2. A language course.

(a) The languages available include Arabic, Chinese, French, German, Greek, Irish, Italian, Japanese, Latin, Portuguese, Russian, and Spanish.

(b) Language is required by the College of Arts and Letters and the College of Science. Students with previous background in a language who want to continue their language study must take a placement exam to determine proper placement. However, students with no previous background in a language can elect a beginning-level course. All foreign language departments at Notre Dame offer placement exams. The German placement exam is available online. Placement exams for other languages are given during the First Year Orientation Weekend in August and twice during the school year in time for fall and spring advance registration. Information on language placement is sent to incoming first-year students during the summer.

Students can also use the results from a foreign language credit by examination (AP, SAT II, IB) for placement, as described under the *Credit by Examination* section found on the next page. A maximum of six credits can be granted for performance on a foreign language credit by examination.

Regardless of their scores on placement exams or foreign language credit by examination, students in the college of Arts and Letters must take at least one language course in residence at Notre Dame at the intermediate or higher level that deals with texts in the original language. In the College of Science, students who place higher than the intermediate level (third semester) are considered to have fulfilled the language requirement and need not take any

additional courses in the language. Students contemplating an international study program that requires language study should consult with the language department regarding appropriate language preparation. All students are encouraged to start their study of language during their first year or the beginning of their second year at the latest.

The Notre Dame placement exam for students who wish to begin language study in their sophomore year will be given again prior to spring advance registration. The appropriate department and the First Year of Studies will guide students with previous instruction in their languages after reviewing their high school background and placement tests.

(c) The first-year student who plans to participate in an International Study Program must use the Course 3 and Course 5 slots to take both a natural science and foreign language. There is no opportunity to take a natural science course abroad, and the requirement must be satisfied by the end of the sophomore year.

3. A second science course.

The programs in the College of Science in the basic sciences—biology, biochemistry, chemistry, mathematics and physics—include more than one science. The second science course sequence for the chemistry and mathematics programs is PHYS 10131–10320; for the environmental science, biochemistry, and biology programs, it is BIOS 10161–10162; and for the physics program, it is PHYS 10411–10522. (Refer to "Natural Sciences, Series I," earlier in this section of the *Bulletin*.)

4. A special course.

(a) The College of Arts and Letters recommends that students intending programs in art take DESN 11100 and ARST 11201; students intending programs in music take MUS 20001 and 20002 and a one-credit skills course each semester.

(b) Students intending to major in architecture are expected to take ARCH 11021 and 10311.

(c) College of Engineering intents should enroll in EG 10111–10112.

COURSE DESCRIPTIONS

ARCH 10311. Analysis of Architectural Writing (4-0-4)

This course examines concepts of architecture within writings about architecture. It explores universal issues of function, strength, and beauty, along with the interactions between theory and practice and the tensions between tradition and innovation. The course work consists of analytical drawings, design exercises, and exams. It is open to all students. Required for those intending to enter the architecture program. Spring.

ARCH 11021. Graphics II: Drafting (3-0-3)

Instruction and practice in the skills necessary to draw and think as an architect. The course emphasizes mechanical drawing with exercises that include descriptive geometry, perspective, and other means of representing three-dimensional architectural problems with two-dimensional techniques, including those using computers. The course is open to all students. Studio format. Required for those intending to enter the architecture program. Spring.

ARCH 11201. Drawing (3-0-3)

This course deals with form depiction in its many aspects and modes and is intended for beginning students as well as advanced students who need additional experience in drawing. Lab fee.

DESN 11100. 2-D Foundations (0-6-3)

Art majors only. This course deals with fundamentals of two-dimensional design and is intended for students entering studio practice for the first time. The course is also open to more advanced students who wish to increase their knowledge of the elements and principles of design. The course is project-oriented. Studio practice in the basic principles of design employing color theory, form, and space organization, as well as materials and processes used in the design process, are emphasized. Lab fee.

EG 10111. Introduction to Engineering Systems I (3-0-3)

The first of a two-part sequence intended to introduce engineering to first-year intents and to establish a foundation for their studies in any of the engineering disciplines. Team-oriented design projects are used to provide a multidisciplinary view of engineering systems and to present the engineering method. Structured programming is introduced, and computing skills are developed for engineering analysis, synthesis, and technical communication.

EG 10112. Introduction to Engineering Systems II (3-0-3)

Prerequisite(s): EG 10111, MATH 10055

The second of a two-course sequence intended to continue the introduction of first-year intents to the engineering disciplines. Multidisciplinary projects are used to illustrate the application of engineering modeling, analysis, and design principles to solve a variety of practical problems. The projects are intended to span areas of interest in all departments of the College of Engineering. Structured programming and software skills are further developed.

MUS 20001. Theory I (3-0-3)

Prerequisite(s): Musical background

A systematic approach to the understanding and manipulation of the basic materials of music. Required of and intended for music majors and minors, but open to students with sufficient musical background.

MUS 20002. Music Theory II
(3-0-3)*Prerequisite(s):* MUS 20001

A systematic approach to the understanding and manipulation of the basic materials of music. Required of and intended for music majors and minors, but open to students with sufficient musical background.

MUS 20011. Musicianship I
(1-0-1)

Exercise and mastery of basic skills in music: melodic, harmonic, rhythmic, and keyboard. To be taken along with Theory I and II. Required of all students intending to major in music.

MUS 20012. Musicianship II
(1-0-1)

Exercise and mastery of basic skills in music: melodic, harmonic, rhythmic, and keyboard. To be taken along with Theory I and II. Required of all students intending to major in music.

Physical Education or Reserve Officers Training Corps Program

All Notre Dame first-year students must take two semesters of physical education as a University requirement. However, first-year students who enroll and remain in an ROTC program are exempted from physical education.

For more information about the physical education courses, refer to the course descriptions under the Physical Education section of this *Bulletin*.

Credit by Examination

Entering first-year students may become eligible for credit by examination in four ways: (1) through the Advanced Placement Program administered by the College Entrance Examination Board, (2) through the SAT II-Subject Tests in French, German, Italian, and Spanish, (3) through the International Baccalaureate Program administered by International Baccalaureate North America, and (4) through the Notre Dame Mathematics Credit Examination Program.

1. Advanced Placement Program (AP)—Students who submit results of Advanced Placement examinations are eligible to receive credit in accordance with the accompanying table.

2. SAT-II Subject Tests (SAT II)—Results of CEEB Advanced Placement Examinations or the SAT-II Subject Tests in French, German, Italian, or Spanish are used for course placement and credit by examination purposes in accordance with the accompanying table.

3. International Baccalaureate Program (IB)—Students who submit results of International Baccalaureate Higher Level examinations are eligible to receive credit in accordance with the accompanying

table. The University does not give credit for Subsidiary Level examinations.

4. Notre Dame Mathematics Credit Examination Program—First-year students may take examinations for possible course credit in mathematics. The examinations will be based on college-level courses.

In all of the cases, the credit awarded by the dean of the First Year of Studies is entered on the student transcript, which is maintained by the registrar's office. This credit can be applied toward required or elective courses if the student's particular college program permits. If Advanced Placement, International Baccalaureate or Notre Dame Mathematics Examination credit is not applicable in a specific college program, that credit is recorded on the student's transcript, but it represents credit in excess of graduation requirements.

The general guideline is that credit by examination is counted as required or elective credit if the course is required or permitted in a particular college program. Credit by examination is not counted as required or elective credit if the number of the course for which credit is awarded is lower than the initial course required in a particular college program. For example, if a student earns a 4 on the Advanced Placement Physics B test, the six credits awarded for PHYS 10111–10122 would count toward graduation in a College of Arts and Letters, Mendoza College of Business, or School of Architecture program. The credits would not count toward graduation in the engineering college program since the initial physics course in this college program is PHYS 10310. On the other hand, if the number of the course for which credit is awarded is higher than the initial course required in a particular college program, the credit awarded satisfies that requirement. For example, credit awarded for MATH 10550–10560 also satisfies the mathematics requirement for programs requiring MATH 10350–10360 or MATH 10250–10260.

Language placement—Students with previous background in a language who want to continue their language study must take a placement exam to determine proper placement. However, students with no previous background in a language can elect a beginning-level course. All foreign language departments at Notre Dame offer placement exams. The German Placement Exam is available online. Placement exams for the other languages are given during the First Year Orientation Weekend in August and twice during the school year in time for fall and spring advanced registration. Information on language placement is sent to incoming first-year students during the summer.

Students can also use the results from a foreign language credit by examination (AP, SAT II, IB) for placement, as described under the *Credit by Examination* previous section. A maximum of six credits can be granted for performance on a foreign language credit by examination.

Regardless of their scores on placement exams or foreign language credit by examinations, students in the College of Arts and Letters must take at least one language course in residence at Notre Dame at the intermediate or higher level that deals with texts in the original language. In the College of Science, students who place higher than the intermediate level (third semester) are considered to have fulfilled the language requirement and need not to take any additional courses in the language. Students contemplating an international study program that requires language study should consult with the language department regarding appropriate language preparation. All students are encouraged to start their study of language during their first year or the beginning of their second year at the latest.

The Notre Dame placement exam for students who wish to begin language study in their sophomore year, will be given again prior to spring advanced registration. The appropriate department and the First Year of Studies will guide students with previous instruction in their languages after reviewing their high school background and placement test results.

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<i>IB Examination Higher Level</i>	<i>IB Grade Required</i>	<i>Number of Credit Hours Awarded</i>	<i>Notre Dame Course Typically Waived</i>
Biology	6	6	Biological Sciences 10101–10107
	7	8	Biological Sciences 20201–20202
Chemistry	6	6	Chemistry 10101–10102
	7	8	Chemistry 10117–10118
Economics	6	6	Economics 10010–10020
English	6	3	First-Year Composition 13100
Foreign Languages			
Arabic	6	6	Arabic 10001–10002
Chinese	6	6	Chinese 10101–10102
French	6	6	French 10101–10102
German	6	6	German 10101–10102
Greek	6	6	Greek 10001–10002
Italian	6	6	Italian 10101–10102
Japanese	6	6	Japanese 10101–10102
Latin	6	6	Latin 10001–10002
Russian	6	6	Russian 10101–10102
Spanish	6	6	Spanish 10101–10102
History of Americas	6	6	History 10600–10605
Mathematics	6	6	Mathematics 10250–10260
	7	8	Mathematics 10550–10560
Music	6	3	Music 10190
Physics	6	6	Physics 10111–10122
	7	8	Physics 10310–10320
Psychology	6	3	Psychology 10000
Social and Cultural Anthropology	6	3	Anthropology 10109

College Credit from Other Institutions

A. College courses completed on college campuses and used to satisfy high school graduation requirements or Notre Dame requirements for first-year admission are *not* accepted for credit.

B. Other college courses completed on college campuses prior to first-year enrollment at Notre Dame are considered for credit as determined by the First Year of Studies in consultation with the University's other colleges and departments. Normally, courses specified in the First Year Curriculum may not be satisfied through transfer credit. First-year students will be instructed to resolve all college credit situa-

tions before or during their first semester at Notre Dame and should present an official transcript and a copy of the published description of the course.

Advising Program

During the first year, academic and personal advising is provided by the First Year of Studies Office. First-year advising is done through a team approach. Each student is assigned to an advising team, which includes an advisor-director, several undergraduate peer advisors and consultants from among the faculties of the many departments of the University.

A meeting between a first-year student and a member of his or her advising team may be initiated by

the advising team or by the student. A first-year student may request a meeting with a member of his or her advising team at any time and for any reason. All first-year students are encouraged to take advantage of this opportunity for personal guidance and assistance.

FIRST YEAR OF STUDIES

Learning Resource Center

The Learning Resource Center houses the Learning Strategies Program, the Tutoring Program, and the Collaborative Learning Program.

LEARNING STRATEGIES PROGRAM

All first-year students interested in improving their skills for success in college may schedule workshops or individual meetings. The Learning Strategies Program covers a variety of topics of practical value to students (e.g., time management, note taking, test preparation), including individual assistance with writing and reading.

TUTORING PROGRAM

The First Year of Studies Tutoring Program is available to all first-year students who would like to improve their understanding of course material. Students meet in small groups of up to 15. The smaller size and more flexible pace of the tutoring session encourages peer interaction, which may not occur naturally in a large lecture format, in addition to the more traditional tutor-student interaction, and provides a conducive setting for students to ask individual questions.

The tutoring offered through this program is not meant to replace classroom instruction, tutorials, recitation-quiz sections, private meetings or any other aids offered by a teacher or through a course.

Some of the tutoring is done individually, but most is done in small groups. There is never a charge for tutoring in the First Year of Studies tutoring program.

COLLABORATIVE LEARNING PROGRAM

The Collaborative Learning Program is open to all first-year students. In collaborative learning sessions, students solve homework problems together with more of a focus on the problem-solving method used rather than the correct answer. Collaborative learning resource leaders monitor the sessions, encourage problem-solving and collaboration among group members, and help answer questions when necessary.

SAT-II Subject Tests — Results of CEEB Advanced Placement Examinations or the SAT-II Subject Tests in French, French w/ Listening, German, German w/ Listening, or Spanish, Spanish w/ Listening are used for course placement and credit by examination purposes in accordance with the following schedules:

<i>FRENCH and FRENCH with LISTENING SAT-II Subject Test</i>	<i>Advanced Placement</i>	<i>Credits (Courses)</i>	<i>Placement Level</i>
790–800	5 (lang.)/4 (lit.)	6 (20201–20202)	30310 or 30320
690–780	4 (lang.)/3 (lit.)	6 (20201–20202)	20300 or higher
590–680	3 (lang.)/2 (lit.)	6 (10102–20201)	20202
490–580	2 (lang.)/1 (lit.)	6 (10101–10102)	20201 or 20215
480	1 (lang.)	3 (10101)	10102/10115

<i>SPANISH and SPANISH with LISTENING SAT-II Subject Test</i>	<i>Advanced Placement</i>	<i>Credits (Courses)</i>	<i>Placement Level</i>
800	5 (lang.)/4 (lit.)	6 (20201–20202)	30310 or 30320
690–790	4 (lang.)/3 (lit.)	6 (20201–20202)	20300 or higher
570–680	3 (lang.)/2 (lit.)	6 (10102–20201)	20202
460–560	2 (lang.)/1 (lit.)	6 (10101–10102)	20201
450	1 (lang.)	3 (10101)	10102/10115

<i>GERMAN and GERMAN with LISTENING SAT-II Subject Test</i>	<i>Advanced Placement</i>	<i>Credits (Courses)</i>	<i>Placement Level</i>
790–800	5 (lang.)/4 (lit.)	6 (10102–20201)	20202 or 30000+
690–780	4 (lang.)/3 (lit.)	6 (10101–10102)	20201
590–680	3 (lang.)/2 (lit.)	3 (10101)	10102

<i>ITALIAN and ITALIAN with LISTENING SAT-II Subject Test</i>	<i>Advanced Placement</i>	<i>Credits (Courses)</i>	<i>Placement Level</i>
790–800	5 (lang.)/4 (lit.)	6 (20201–20202)	30310
690–780	4 (lang.)/3 (lit.)	6 (10102–10201)	20202
590–680	3 (lang.)/2 (lit.)	6 (10101–10102)	10201
490–580	2 (lang.)/1 (lit.)	3 (10101)	10102

FIRST YEAR OF STUDIES

<i>Advanced Placement Examination</i>	<i>Advanced Placement Grade Required</i>	<i>Number of Credits Awarded</i>	<i>Notre Dame Course Typically Waived</i>
American History	4	6	History 10600 and 10605
Biology	5	8	Biological Sciences 20201 and 20202
Biology	4	3	Biological Sciences 10101
Calculus AB	3	3	Mathematics 10250
Calculus AB	4	4	Mathematics 10550
Calculus BC	3	3	Mathematics 10250
Calculus BC	4	8	Mathematics 10550 and 10560
Calculus BC (AB Subscore)	3	3	Mathematics 10250
Calculus BC (AB Subscore)	4	4	Mathematics 10550
Chemistry	5	8	Chemistry 10117 and 10118
Chemistry	4	3	Chemistry 10101
Computer Science A	4	3	Business Administration 10500 (elective credit)
Economics (Macroeconomics)	5	3	Economics 10020
Economics (Microeconomics)	5	3	Economics 10010
English (either exam)	4	3	First-Year Composition 13100
European History	4	6	History 10200 and 10400
Government (American Politics)	4	3	Political Science 10100
Government (Comparative)	4	3	Political Science 10400
Latin (either exam)	4	6	Latin 10002 and 20003
Physics B	5	8	Physics 30210 and 30220
Physics B	4	6	Physics 10111 and 10122
Physics C, Mechanics	5	4	Physics 10310
Physics C, Mechanics	4	3	Physics 10111
Physics C, Elec. and Magnetism	5	4	Physics 10320
Physics C, Elec. and Magnetism	4	3	Physics 10122
Psychology	4	3	Psychology 10000
Statistics	5	3	Mathematics 10140