



Physical Science

Architecture
Astronomy
Chemistry
Engineering
Geography
Geology
Physical Science
Physics

The Bakersfield College Physical Science Department encompasses a large number of fields. Courses within these fields are taken by those who are preparing for a career in science or engineering, those who are fulfilling a General Education science requirement, and those simply wishing to learn about one or more of these fields.

Students who intend to transfer to four-year institutions as science or engineering majors can fulfill their lower division science requirements at Bakersfield College. Our students traditionally have been successful in upper division science studies at the University of California, the state colleges and universities, and at private universities.

Within the Physical Science Department, a student not only has many choices of major but also has the opportunity to explore a number of interesting possibilities. In some cases, general survey courses are available both for the potential science major who is “looking around” and for the non-science major who wants to learn some science. We are committed to making the learning of science interesting, meaningful, and enjoyable to our students.

ASSOCIATE DEGREE PROGRAMS

Associate in Arts degrees can be earned in most areas by fulfilling college major and General Education requirements. The Associate in Science Degree is available to those who complete the course of study defined for the major as well as the General Education requirements as outlined earlier in this catalog.

Counselors, advisors, and department faculty will aid students in planning for either the Associate in Arts or Associate in Science Degree.

The course requirements for Associate Degree programs are outlined below. The requirements shown are limited to those courses in the subject and related subjects that are needed for the degree. General Education courses as well as minimum competency levels as outlined under Graduation Requirements must be satisfied as well.

In addition to the course requirement list, suggested programs for each area are shown in order to help plan courses of study. Because students vary in their preparation and in rates of progress through a curriculum, some alteration in the programs as shown is likely in individual cases.

ASSOCIATE IN ARTS DEGREE PROGRAMS

Architectural Drafting

Required Courses: 24.5 units

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B6	Materials of Construction	3.0
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0

ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
ARCH B21	Architectural Design Fundamentals I	4.0
ARCH B31	Architectural Practice	3.0
ARCH B32	Architectural Computer Graphics	1.0
ARCH B33	Architectural Computer Practice	3.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0

Electives

Course Number	Title	Units
INDR B20a	Computer Aided Drafting and Design (CAD)	3.0
ARCH B55	Building Codes	3.0
MATH BD	Intermediate Algebra	4.0

ASSOCIATE IN SCIENCE DEGREE PROGRAMS

Architecture/Architectural Drafting

Required Courses: 35.5 units

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B6	Materials of Construction	3.0
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0
ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
ARCH B21	Architectural Design Fundamentals I	4.0
ARCH B22	Architectural Design Fundamentals II	4.0
ARCH B31	Architectural Practice	3.0
ARCH B32	Architectural Computer Graphics	1.0
ARCH B33	Architectural Computer Practice	3.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0
MATH BC	Plane Trigonometry	3.0
PHYS B2a	General Physics-Mechanics and Heat	4.0

Recommended Courses

Course Number	Title	Units
INDR B20a	Computer Aided Drafting and Design (CAD)	3.0

Suggested Program for Architecture/Architectural Drafting A.S. Degree

First Semester

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0

Second Semester

Course Number	Title	Units
ARCH B6	Materials of Construction	3.0
ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
MATH BC	Plane Trigonometry	3.0

Third Semester

Course Number	Title	Units
ARCH B21	Architectural Design Fundamentals I	4.0
ARCH B32	Architectural Computer Graphics	1.0
PHYS B2a	General Physics-Mechanics and Heat	4.0

Fourth Semester

Course Number	Title	Units
ARCH B22	Architectural Design Fundamentals II	4.0
ARCH B33	Architectural Computer Practice	3.0

Chemistry

Required Courses: 32 units

Course Number	Title	Units
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
CHEM B8	Elementary Organic Chemistry	3.0
CHEM B9	Organic Chemistry Laboratory	3.0
BIOL B16 or BIOL B3a or BIOL B11	*General Microbiology General Biology I Concepts of Biology (4.0)	5.0
MATH B1 or MATH B6a	Mathematical Analysis *Analytic Geometry and Calculus I	4.0
PHYS B4c or PHYS B2a and PHYS B2b	*Optics and Modern Physics General Physics-Mechanics and Heat General Physics-Sound, Light, Electricity, Magnetism, Modern Physics	4.0
COMS B12 or COMS B11 or COMS B13	Introduction to Programming with BASIC Introduction to Programming with Pascal Introduction to Programming with FORTRAN	3.0

*Recommended courses

Electives

PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0

Suggested Program for Chemistry A.S. Degree

First Semester

Course Number	Title	Units
CHEM B1a or PHYS B2a	General Chemistry General Physics-Mechanics and Heat (4.0)	5.0
MATH B6a or MATH B1	Analytic Geometry and Calculus I Mathematical Analysis	4.0

Second Semester

Course Number	Title	Units
CHEM B1b	General Chemistry and Chemical Analysis	5.0
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B2b	General Physics-Sound, Light, Electricity, Magnetism, Modern Physics	4.0
MATH B6a or MATH B6b	Analytic Geometry and Calculus I Analytic Geometry and Calculus II	4.0

Third Semester

Course Number	Title	Units
CHEM B8	Elementary Organic Chemistry	3.0
CHEM B9	Organic Chemistry Laboratory	3.0
MATH B6c	Calculus III	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0

Fourth Semester

Course Number	Title	Units
PHYS B4c	Optics and Modern Physics	4.0
BIOL B16 or BIOL B3a or BIOL B3b or BIOL B11	General Microbiology General Biology I (5.0) General Biology II (5.0) Concepts of Biology (4.0)	5.0
COMS B12 or COMS B11 or COMS B13	Introduction to Programming with BASIC Introduction to Programming with Pascal Introduction to Programming with FORTRAN	3.0

Engineering

Required Courses: 54 units

Course Number	Title	Units
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B6c	Calculus III	4.0
MATH B6d	Ordinary Differential Equations	3.0
CHEM B1a	General Chemistry	5.0
ENGL B1a	Expository Composition	4.0
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
PHYS B4c	Optics and Modern Physics	4.0
ENGR B17	Introduction to Electric Circuits	3.0
ENGR B24	Engineering Graphics and Descriptive Geometry	2.0
ENGR B36	Engineering Mechanics-Statics	3.0
ENGR B45	Properties of Materials	3.0
ENGR B48	Engineering Orientation	1.0
ENGR B19fpc	Computer Programming for Science, Engineering and Technology	3.0

Geology

Required Courses: 30-31 units

Course Number	Title	Units
GEOL B1a	Physical Geology	4.0
GEOL	Electives	7.0
CHEM B1a or CHEM B2a	General Chemistry Introductory General Chemistry	5.0
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
MATH BC	Plane Trigonometry	3.0
MATH BD or COMS B12	Intermediate Algebra Introduction to Programming with BASIC (3.0)	4.0
COMS B11 or COMS B13	Introduction to Programming with Pascal Introduction to Programming with FORTRAN	3.0
PHYS B2a	General Physics-Mechanics and Heat	4.0

Suggested Program for Geology A.S. Degree

First Semester

Course Number	Title	Units
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
GEOL B1a	Physical Geology	4.0
MATH BD	Intermediate Algebra	4.0

Second Semester

Course Number	Title	Units
MATH BC	Plane Trigonometry	3.0

Third Semester

Course Number	Title	Units
CHEM B2a	Introductory General Chemistry	5.0
COMS B12	Introduction to Programming with BASIC	3.0

Fourth Semester

Course Number	Title	Units
PHYS B2a	General Physics-Mechanics and Heat	4.0
GEOL	Elective	3.0
GEOL	Elective	2-3.0
	Elective	3.0

Suggested Electives

Course Number	Title	Units
ART B3cd	Three Dimensional Design	3.0
BUS B5	Human Relations and Motivation	3.0

Physics

Required Courses: 37 units

Course Number	Title	Units
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
PHYS B4c	Optics and Modern Physics	4.0
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B6c	Calculus III	4.0
COMS B11	Introduction to Programming with Pascal	3.0

SUGGESTED TRANSFER PROGRAMS

California State Polytechnic University, San Luis Obispo

Architecture (arch.), Architectural Engineering (A.E.), City And Regional Planning (C.R.P.), Construction (con.), Landscape Architecture (l.a.)

The following curriculum is designed for students planning to transfer to the College of Architecture and Environmental Design at California State Polytechnic University, San Luis Obispo. The student is advised to keep a portfolio of all work done in all architectural classes, since the level of advanced standing is dependent upon an evaluation of this portfolio by faculty at Cal Poly, S.L.O. Entry as a transfer student to Cal Poly, S.L.O. is based upon a strong grade point average (G.P.A.), certification of general elective courses, including Calculus B6a-B6b, Physics B4a and the architecture courses listed below for the Mutli-Criteria Application (MCA) process.

In the College of Architecture and Environmental Design at Cal Poly, there are five majors: Architecture, Architectural Engineering, Construction, City and Regional Planning, and Landscape Architecture. The Bachelor of Architecture and Bachelor of Landscape Architecture degrees are five-year programs. The other three majors are four-year degree programs. It is the exceptional student who is able to complete these programs in the allotted time. Many students find that it takes an additional year of study to complete any of the

five programs listed. This may mean taking course work during the summer or spending an additional year at Bakersfield College and/or at Cal Poly.

In addition, Cal Poly, S.L.O. offers two graduate programs. The Master of Science in Architecture and the Master of City and Regional Planning for those students interested in advanced professional studies.

Architecture

2-year transfer program for those students who are entering college ready to take Math Analysis (MATH B1) or Calculus (MATH B6A) and English B1 or B1A.

Recommended Courses for Transfer to California State Polytechnic University, S.L.O.

First Semester

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0
MATH B6a	Analytic Geometry and Calculus I	4.0

Second Semester

Course Number	Title	Units
ARCH B6	Materials of Construction	3.0
ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0

Third Semester

Course Number	Title	Units
ARCH B21	Architectural Design Fundamentals I	4.0
ARCH B31	Architecture Practice	3.0
ARCH B32	Architectural Computer Graphics	1.0

Fourth Semester

Course Number	Title	Units
ARCH B22	Architectural Design Fundamentals II	4.0
ARCH B33	Architectural Computer Practice	3.0
PHYS B4a	Mechanics and Wave Motion	4.0

Additional recommended courses for Cal Poly, S.L.O. common to all five majors

Course Number	Title	Units
PSYC B1a	General Psychology	3.0
SPCH B1	Speech Communication	3.0
PHIL B7	Introduction to Logic	3.0

Architecture

Course Number	Title	Units
ECON B2	Principles of Economics-Macro	3.0
BIOL B11	Concepts of Biology (Life Science elective)	4.0
GEOG B1	Introduction to Geography: Physical Elements	3.0

COMS B12	Introduction to Programming with BASIC	3.0
MATH B22	Elementary Probability and Statistics	5.0

Architectural Engineering

Course Number	Title	Units
MATH B6c	Calculus III	4.0
MATH B6d	Ordinary Differential Equations	3.0
CHEM B1a	General Chemistry	5.0
GEOL B1a	Physical Geology	4.0
HLED B1	Principles of Health Education	3.0
COMS B12	Introduction to Programming with BASIC (elective)	3.0
ECON B2	Principles of Economics-Macro	3.0
BIOL B11	Concepts of Biology	4.0

Construction

Course Number	Title	Units
GEOL B1a	Physical Geology	4.0
ECON B2	Principles of Economics-Macro	3.0
BSAD B18a	Business Law	3.0
GEOG B1	Introduction to Geography: Physical Elements	3.0

City & Regional Planning

Course Number	Title	Units
COMS B12	Introduction to Programming with BASIC	3.0
GEOG B1	Introduction to Geography: Physical Elements	3.0
ECON B1	Principles of Economics-Micro	3.0
ECON B2	Principles of Economics-Macro	3.0
PHYS B2a or	General Physics-Mechanics and Heat	4.0
BIOL B11	Concepts of Biology	4.0
MATH B22	Elementary Probability and Statistics	5.0
GEOL B1a	Physical Geology	4.0

Landscape Architecture

Course Number	Title	Units
BIOL B3a	General Biology I	5.0
SOIL B1	Introduction to Soil Science	3.0
COMS 12	Introduction to Programming with BASIC (Elective)	3.0
ECON B2	Principles of Economics-Macro	3.0
PHYS B2a	General Physics-Mechanics and Heat	4.0
GEOG B1	Introduction to Geography: Physical Elements	3.0

Pre-Architecture: Those students entering Bakersfield College who have not completed three years of math and are not ready to enter MATH B1 (Math Analysis) should plan on spending at least three years at Bakersfield College to complete the lower division requirements for the architecture major at Cal Poly, S.L.O. and an additional three and one-half to four years at Cal Poly, S.L.O.

Pre-Architecture

Recommended 3-year program for those students who are entering college behind in their math, English, and/or GE requirements

California State Polytechnic University, S.L.O.

First Semester

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0
MATH BD	Intermediate Algebra	4.0

Second Semester

Course Number	Title	Units
ARCH B6	Materials of Construction	3.0
ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
INDR B20a	Computer Aided Drafting and Design (CAD) (elective)	3.0
MATH BB	Geometry	3.0

Third Semester

Course Number	Title	Units
ARCH B31	Architectural Practice	3.0
ARCH B32	Architectural Computer Graphics	1.0
MATH BC	Plane Trigonometry	3.0

Fourth Semester

Course Number	Title	Units
ARCH B33	Architectural Computer Practice	3.0
MATH B1	Mathematical Analysis	4.0

Fifth Semester

Course Number	Title	Units
ARCH B21	Architectural Design Fundamentals I	4.0
MATH B6a	Analytic Geometry and Calculus I	4.0

Sixth Semester

Course Number	Title	Units
ARCH B22	Architectural Design Fundamentals II	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
PHYS B4a	Mechanics and Wave Motion	4.0

Cal Poly, Pomona

California State Polytechnic University, Pomona offers three undergraduate majors leading to the Bachelor of Science Degree in Architecture, Landscape Architecture, and Urban Planning. The student while attending Bakersfield College should plan on taking the same basic Architecture program as for Cal Poly, San Luis Obispo, but substituting MATH BC (Trig) for MATH B6a-B6b and PHYS B2a for PHYS B4a. Entry to Cal Poly, Pomona is based on a strong G.P.A., the above Math and Physics courses, English B1a and B1b, or English B2 and as many architecture courses as possible. A portfolio will be required for advanced placement into the architecture program. A Master's Degree is available in all three areas of study.

UC Berkeley

Students planning to transfer to the University of California, Berkeley should expect to take the following recommended courses. Berkeley has a 4-year curriculum leading to the A.B. Degree in the College of Environmental Design, with majors in Architecture Design, Landscape Architecture and City Regional Planning. A Master's Degree in Architecture, Landscape Architecture, or City Regional Planning would require an additional two years.

Recommended Courses

Course Number	Title	Units
ARCH B1	Introduction to Architecture and Environmental Design	1.5
ARCH B11	Introduction to Drawing, Perspective and Graphics	4.0
ARCH B12	Basic Graphics, Analysis and Communication Skills	4.0
ARCH B21	Architectural Design Fundamentals I	4.0
ARCH B22	Architectural Design Fundamentals II	4.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0

PRIVATE UNIVERSITIES/COLLEGES

The following list are those private universities/colleges offering degrees in architecture within the State of California.

California College of Arts and Crafts-San Francisco
 New School of Architecture-San Diego
 Southern California Institute of Architecture-Santa Monica
 University of Southern California-Los Angeles
 Woodbury University-Burbank

Students interested in one of the above programs offered at these campuses should consult with the individual dean of the college they are interested in as to entry requirements. UC Los Angeles offers a graduate degree only.

Chemistry

UC Berkeley, CSU San Jose, CSU San Diego, CSU Fresno

The courses listed below are required for the above institutions and for most other four-year colleges and universities in order to transfer into the third year of a chemistry major program. Before planning a study list, the community college student should consult his/her counselor and study the catalog of the senior institution to which he/she intends to transfer.

The introductory courses in Physics (Physics B2a-B2b or B4a-B4c) and Chemistry (Chemistry B1a-B1b, B2a or B11) are designed to provide a foundation and understanding of the laws and principles of the physical world (matter and energy). These courses should be completed early in a student's academic program to insure greater success in subsequent courses.

Required Courses: 34 units

Course Number	Title	Units
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B6c	Calculus III	4.0
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
PHYS B4c	Optics and Modern Physics	4.0

Recommended Courses

Course Number	Title	Units
MATH B6d	Ordinary Differential Equations	3.0
COMS B12	Introduction to Programming with BASIC	3.0
COMS B11	Introduction to Programming with Pascal	3.0
COMS B13	Introduction to Programming with FORTRAN	3.0

Engineering

University of California, California State University and Private Universities

People working in the field of engineering and related technical fields "bridge the gap" between scientific principles and the application of these principles to the needs of society. The field is quite diversified with exciting job opportunities for people with varied mathematical, scientific, and technical skills.

An engineer uses experience and judgment, as well as advanced training in engineering, science, and mathematics to formulate ideas and designs, and to determine standards, specifications, work orders and schedules so that projects can be economically beneficial to mankind. A Bachelor of Science Degree in Engineering is required. Many engineers earn Master's or Doctor's degrees.

Working together with a counselor or academic advisor, a student may develop a program of study leading to transfer into the upper division of a Bachelor's Degree program in Engineering. The programs which follow will help the student plan an appropriate program.

Bakersfield College offers all of the courses required for two full years of engineering education. Completion of these courses, called the "engineering core" prepares students for transfer at the junior level to the colleges and universities offering Bachelor's degrees in engineering. This is in accordance with the Summit Articulation Agreement of the Engineering Liaison Committee which states that "any students of a California Community College, with a stated major in engineering, who presents a transcript showing satisfactory completion of the engineering core program in lower division will be eligible to enroll in any four-year California university or college (which graduates engineers) with regular junior standing; and further, said student can complete an engineering program in four additional semesters (or six additional quarters) and obtain a Bachelor's Degree."

The engineering core curriculum is the basis for Transfer Admission Agreements between Bakersfield College and the engineering colleges at several universities including the University of California at Davis and Rensselaer Polytechnic Institute in Troy, New York. The following Bakersfield College courses are required to completely satisfy the engineering core program:

Course Number	Title	Units
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B6c	Calculus III	4.0
MATH B6d	Ordinary Differential Equations	3.0
CHEM B1a	General Chemistry	5.0
ENGL B1a	Expository Composition	4.0
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
PHYS B4c	Optics and Modern Physics	4.0
ENGR B17	Introduction to Electric Circuits	3.0
ENGR B24	Engineering Graphics and Descriptive Geometry	2.0
ENGR B36	Engineering Mechanics-Statics	3.0
ENGR B45	Properties of Materials	3.0
ENGR B48	Engineering Orientation	1.0
ENGR B19fpc	Computer Programming for Science, Engineering and Technology	3-3-3.0

The following technical electives are highly recommended for all branches of engineering:

Course Number	Title	Units
MATH B6e	Elementary Linear Algebra	3.0
ENGR B49	Engineering Analysis and Design	1.0
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0
CHEM B3	General Chemistry and Chemical Analysis for Engineers	3.0

The following technical electives are recommended for the particular branches listed:

GEOL B1a	Physical Geology-geological petroleum
MATH B22	Elementary Probability and Statistics-computer
APRD B1a	Beginning Machine Shop (manufacturing, industrial)
APRD B55	Introduction to Numerical Control and Fundamentals of Programming-manufacturing, industrial
WELD B1a	Introduction to the Welding Processes-manufacturing, industrial
CHEM B1b	General Chemistry and Chemical Analysis

Four-year colleges and universities neither require, nor recommend, that engineering majors complete lower division general education requirements prior to transfer. For students transferring to campuses of the University of California or to California Polytechnic University, San Luis Obispo, the following courses are recommended if they can be included in the student's schedule:

Course Number	Title
SPCH B1	Speech Communication
ENGL B2	Advanced Composition and Critical Thinking

Two-year Engineering Program

The program shown below assumes satisfactory prior completion of the following:

- high school mathematics through trigonometry and mathematical analysis; or MATH BC and MATH B1 at Bakersfield College
- one year of high school mechanical drawing or INDR B10 at Bakersfield College
- one year of high school chemistry or CHEM B2a at Bakersfield College
- eligibility for ENGL B1a

Students missing one of the requirements (b), (c), or (d) still may be able to complete the program within two years, as long as requirement (a) is met on entrance. Students completing the two-year program will not be able to earn an A.S. Degree from Bakersfield College unless they have satisfied general education requirements with summer courses or courses taken prior to entering the program.

First Semester

Course Number	Title	Units
MATH B6a	Analytic Geometry and Calculus I	4.0
CHEM B1a	General Chemistry	5.0
ENGR B48	Engineering Orientation	1.0
ENGR B49	Engineering Analysis and Design	1.0
ENGR B19fpc	Computer Programming for Science, Engineering and Technology	3-3-3.0
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
INDR B11	Introduction to Computer Aided Drafting and Design (CAD)	1.0

Second Semester

Course Number	Title	Units
MATH B6b	Analytic Geometry and Calculus II	4.0
CHEM B1b or CHEM B3	General Chemistry and Chemical Analysis for Engineers	5.0
PHYS B4a	Mechanics and Wave Motion	4.0
ENGR B24	Engineering Graphics and Descriptive Geometry	2.0
	Technical Elective or General Education	3.0

Note: CHEM B1b or CHEM B3 should be taken depending on major.

Third Semester

Course Number	Title	Units
MATH B6c	Calculus III	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
ENGR B45	Properties of Materials	3.0
ENGL B1a	Expository Composition	4.0

Fourth Semester

Course Number	Title	Units
MATH B6d	Ordinary Differential Equations	3.0
PHYS B4c	Optics and Modern Physics	4.0
ENGR B36	Engineering Mechanics-Statics	3.0
ENGR B17	Introduction to Electric Circuits	3.0
	Technical Elective or General Education	3-5.0

Three-Year Pre-Engineering/Engineering Program

Those students who have not met the requirements for the two-year program will need more than four semesters to complete the engineering core program. The program shown below assumes only satisfactory completion of high school mathematics through intermediate algebra or MATH BD at Bakersfield College and eligibility for ENGL B1. It allows students to complete the general education requirements for the Associate in Science Degree while completing the engineering core program before transferring to a university as a junior. Students completing the A.S. Degree should select general education courses which will also satisfy university general education courses, and should understand that, while they will have completed more than 70 transferable units, the university will give them credit for satisfactory completion of all transferable courses but for only 70 units toward the Bachelor's degree.

First Semester

Course Number	Title	Units
MATH BC	Plane Trigonometry	3.0
ENGL B1	Introductory Composition	3-4.0
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
ENGR B48	Engineering Orientation	1.0
INDR B11	Introduction to Computer Aided Drafting and Design (CADD)	1.0

Second Semester

Course Number	Title	Units
MATH B1	Mathematical Analysis	4.0
CHEM B2a	Introductory General Chemistry	5.0
ENGR B24	Engineering Graphics and Descriptive Geometry	2.0

Third Semester

Course Number	Title	Units
MATH B6a	Analytic Geometry and Calculus I	4.0
CHEM B1a	General Chemistry	5.0
ENGR B49	Engineering Analysis and Design	1.0
ENGR B19fpc	Computer Programming for Science, Engineering and Technology	3-3-3.

Fourth Semester

Course Number	Title	Units
MATH B6b	Analytic Geometry and Calculus II	4.0
CHEM B1b or CHEM B3	General Chemistry and Chemical Analysis for Engineers	5.0 3.0
PHYS B4a	Mechanics and Wave Motion	4.0

Note: CHEM B1b or CHEM B3 should be taken depending on major.

Fifth Semester

Course Number	Title	Units
MATH B6c	Calculus III	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
ENGR B45	Properties of Materials	3.0
ENGL B1a	Expository Composition	4.0

Sixth Semester

Course Number	Title	Units
MATH B6d	Ordinary Differential Equations	3.0
PHYS B4c	Optics and Modern Physics	4.0
ENGR B36	Engineering Mechanics-Statics	3.0
ENGR B17	Introduction to Electric Circuits	3.0
MATH B6e	Elementary Linear Algebra	3.0

Geology

Before planning a study list, the community college student should consult his/her counselor and study the catalog of the senior institution to which he/she wants to transfer.

UCLA

Course Number	Title	Units
GEOL B1a	Physical Geology	4.0
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
PHYS B2a	General Physics-Mechanics and Heat	4.0
PHYS B2b	General Physics-Sound, Light, Electricity, Magnetism, Modern Physics	4.0
BIOL B3a	General Biology I	5.0
BIOL B3b	General Biology II	5.0

San Diego State University

Course Number	Title	Units
GEOL B1a or	Physical Geology	4.0
GEOL B10	Introduction to Geology	3.0
GEOL B10L	Introductory Geology Laboratory	1.0
GEOL B1b	Historical Geology	4.0
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
BIOL B11	Concepts of Biology	4.0
MATH B6a	Analytic Geometry and Calculus I	4.0

Recommended Courses

Course Number	Title	Units
INDR B10	Introduction to Industrial Drawing and Graphics	1.0
MATH B6b	Analytic Geometry and Calculus II	4.0

Physics**All Four-Year Colleges and Universities**

Before planning a study list, the community college student should consult a counselor and study the catalog of the senior institution to which he/she intends to transfer.

The introductory courses in Physics (Physics B2a-B2b or B4a-B4c) and Chemistry (Chemistry B1a-B1b, B2a or B11) are designed to provide a foundation and understanding of the laws and principles of the physical world (matter and energy). These courses should be completed early in a student's academic program to insure greater success in subsequent courses.

Course Number	Title	Units
PHYS B4a	Mechanics and Wave Motion	4.0
PHYS B4b	Heat, Electricity, and Magnetism	4.0
PHYS B4c	Optics and Modern Physics	4.0
CHEM B1a	General Chemistry	5.0
CHEM B1b	General Chemistry and Chemical Analysis	5.0
MATH B6a	Analytic Geometry and Calculus I	4.0
MATH B6b	Analytic Geometry and Calculus II	4.0
MATH B6c	Calculus III	4.0
MATH B6d	Ordinary Differential Equations	3.0
COMS B11	Introduction to Programming with Pascal	3.0

Recommended Courses

Course Number	Title	Units
BIOL B3a	General Biology I	5.0
BIOL B11	Concepts of Biology	4.0
COMS B13	Introduction to Programming with FORTRAN	3.0

COURSE DESCRIPTIONS

The following abbreviations are commonly used in the course descriptions: **lect** lecture; **lab** laboratory; **demo** demonstration; **Repeat** repeatability (see policy on course repetition); **CCS** Course Classification System. Hours given in parentheses are total hours for the course. Hours lecture, lab, etc., are hours required per week usually. **Offered:** F=course is offered fall semester; S=course is offered spring semester; SS=course is offered summer session. If there is no designation, the course is offered irregularly. Check with the department for information. Many classes are offered occasionally during the summer. Check the summer class schedule for additional course listings. Prerequisites are expressed as minimum requirements. See page 40 for a complete explanation. (CSU) indicates transferable to California State Universities; (UC) indicates transferable to University of California.

ARCHITECTURE

ARCH B1 Introduction to Architecture and Environmental Design (1.5 units)

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction and city/regional planning. Introduction to schools of architecture programs as they relate to individual aptitudes. The design process. Guest speakers. Satisfies 0.5 unit counseling

requirement for graduation from B.C. **Hours:** (27) 1.5 lect. Field trips required. **Offered:** F. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

ARCH B6 Materials of Construction (3 units)

Use and application of construction processes and materials. **Recommended:** Reading Level 5 or 6. **Hours:** (90) 2 lect, 3 lab. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

ARCH B11 Introduction to Drawing, Perspective and Graphics (4 units)

Basic techniques used in graphic communications for the environmental design fields including orthographic projection, pictorials, perspectives, shades and shadows. Exercises to develop basic skills and speed in the representation of ideas. **Hours:** (126) 3 lect, 4 lab. **Offered:** F. **CCS:** Occupational Education. **Transferable:** UC, CSU and private colleges.

ARCH B12 Basic Graphics, Analysis and Communication Skills (4 units)

Drawing as a communication tool in the environmental design fields with further development of freehand graphic communication skills for representation of conceptual ideas analysis, and design concepts. Demonstrates the link between graphics, design process and communications. **Prerequisites:** ARCH B11. **Hours:** (144) 2 lect, 6 lab. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Transferable:** UC, CSU and private colleges.

ARCH B21 Architectural Design Fundamentals I (4 units)

Theories, principles, methods and means pertaining to the creation of two-and three-dimensional visual organizations to communicate intended concepts and meanings. **Prerequisite:** ARCH B1, B11, B12. **Hours:** (144) 2 lect, 6 lab. Field trips required. **Offered:** F. **CCS:** Occupational Education. **Transferable:** UC, CSU and private colleges.

ARCH B22 Architectural Design Fundamentals II (4 units)

Continuation of the content and issues introduced in ARCH B21 plus the theories, principles, methods and means pertaining to the creation of architectural forms, space and organizations and incorporation of function and light as issues that shape the built environment and support the communication of intended concepts and meanings. **Prerequisite:** ARCH B21. **Hours:** (144) 2 lect, 6 lab. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Transferable:** UC, CSU and private colleges.

ARCH B31 Architectural Practice (3 units)

Wood construction methods and processes. Construction documents used as communication medium for such methods and processes. **Prerequisites:** ARCH B6, and B11. **Hours:**

(108) 2 lect, 4 lab. Field trips required. **Offered:** F. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

ARCH B32 Architectural Computer Graphics (1 unit)

Introduction to the application of computers in architecture, including operating systems, applications and graphic systems as they relate to construction documents and design technology. **Prerequisites:** INDR B11, ARCH B31 (ARCH B31 may be taken concurrently). **Hours:** (54) 1 lect, 2 lab. **Offered:** F. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

ARCH B33 Architectural Computer Practice (3 units)

The use of computer applications as a communication instrument in the design development and construction document phases of a light commercial project. Theory and application of laws and codes as they affect such buildings. **Prerequisite:** ARCH B32. **Hours:** (108) 2 lect, 4 lab. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Transferable:** CSU and private colleges.

ARCH B55 Building Codes (3 units)

Study of the uniform building codes, local codes and related ordinances. Fundamental structural concepts involved in code work, code interpretation and enforcement. **Recommended:** Reading Level 5 or 6. **Hours:** (54) 3 lect. Field trips required. **Offered:** F. **CCS:** Occupational Education. **Not Transferable:** Associate Degree only.

ARCH B56 Building and Related Codes (3 units)

Study of the uniform building, plumbing, mechanical and electrical codes. A companion course to ARCH B45 offering a greater in-depth study of the various codes which make up the Code of Building Regulations. **Recommended:** Reading Level 5 or 6. **Hours:** (54) 3 lect. Field trips required. **Offered:** S. **CCS:** Occupational Education. **Not Transferable:** Associate Degree only.

ASTRONOMY

ASTR B1 Elementary Astronomy (3 units)

Introductory course emphasizing the fundamental observations and the underlying physical principles in scientific models of astronomy. Among topics included: the motions, properties, and evolution of the sun, planets, stars, galaxies, and universe; the properties of electromagnetic radiation; atomic structure; and astronomical instruments. **Prerequisite:** Reading Level 5 or 6. **Recommended:** Math BA with a grade of "C" or equivalent. **Hours:** (54) 3 lect. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

CHEMISTRY

Credit limitations may apply. For specific information see a counselor.

The introductory courses in Chemistry (Chemistry B1a-B1b, Physics (Physics B2a-B2b or B4a-B4c) are designed to provide the basic foundation in, and understanding of the laws and principles of the physical world (matter and energy) for all science, health, and pre-professional majors. These courses should be completed early in a student's academic program sequence of study to ensure greater academic success in subsequent courses in the student's field of interest and a more complete understanding of that field.

CHEM B1a General Chemistry (5 units)

Basic principles of chemistry, including atomic structure, stoichiometry, reaction energy, chemical bonding, periodic relationships of the elements, states and properties of matter, solutions, introduction to acids and bases, a brief introduction to descriptive chemistry of the elements, and other topics as appropriate. The laboratory emphasizes quantitative methods. **Prerequisite:** Reading Level 5 or 6; CHEM B2a with a grade of "C" or higher or high school chemistry; MATH BD with a "C" or higher or 2 years of high school algebra. **Recommended:** Math prerequisite accomplished within previous 2 years. **Hours:** (162) 3 lect, 5 lab, 1 disc. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN CHEM 2) (CHEM B1a + B1b = CAN CHEM SEQ A)

CHEM B1b General Chemistry and Chemical Analysis (5 units)

Continuation of CHEM B1a. Includes kinetics; equilibrium; thermodynamics; equilibrium as it applies to acid-base, solubility, and electrochemistry; nuclear chemistry; coordination chemistry; the descriptive chemistry of selected elements; and an introduction to organic chemistry. The laboratory includes qualitative analysis, quantitative techniques, and descriptive experiments. **Prerequisite:** CHEM B1a with a grade of "C" or better. **Hours:** (162) 3 lect, 5 lab, 1 disc. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN CHEM 4) (CHEM B1a + B1b = CAN CHEM SEQ A)

CHEM B2a Introductory General Chemistry (5 units)

The principles and applications of general college chemistry. Designed for liberal arts, physical education and some nursing majors. Recommended also for students who need additional background for the more intensive course, CHEM 1a. **Prerequisite:** MATH BA with a grade of "C" or equivalent and Reading Level 5 or 6. **Recommended:** Math prerequisite accomplished within previous 2 years. **Hours:** (162) 3 lect, 4 lab, 2 disc. **Offered:** F, S, SS. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. **Note:** Not open to students with credit in CHEM B1a. (CAN CHEM 6)

CHEM B3 General Chemistry and Chemical Analysis for Engineers (3 units)

Continuation of CHEM B1a, primarily for engineering majors. Includes kinetics; general and ionic equilibrium; thermodynamics; solubility; electrochemistry; nuclear chemistry; metallurgy; descriptive chemistry of silicon, ceramics, organic compounds and polymers. The laboratory includes qualitative analysis, quantitative techniques, and descriptive experiments. **Prerequisite:** CHEM B1a with a grade of "C" or better. **Hours:** (90) 2 lect, 2 lab, 1 disc. **CCS:** Liberal Arts and Sciences. **Transferable:** CSU and private colleges.

CHEM B8 Elementary Organic Chemistry (3 units)

A survey of organic compounds, including the fundamental organic functional groups, proteins, fats, carbohydrates, and representative types of organic chemical reactions. For students interested in chemical industries, medicine, dentistry, pharmacy, biology and related biological fields, engineering, medical terminology, and chiropractic, or students requiring only one semester of organic chemistry to complete chemistry requirements. **Prerequisites:** CHEM B1a or CHEM B2a with a minimum grade of "B." Concurrent enrollment in CHEM B9 required. **Hours:** (54) 3 lect. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

CHEM B9 Organic Chemistry Laboratory (3 units)

Covers fundamental laboratory techniques in organic chemistry including synthesis, separations, and instrumental analysis. Emphasizes handling of small sample sizes. **Prerequisite:** Concurrent enrollment in CHEM B8. (Note: Students who have taken CHEM B8 prior to 1987 may enroll.) **Hours:** (108) 5 lab, 1 disc. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

CHEM B15 Principles of Inorganic Chemistry (4 units)

Designed for ADN nursing and allied-health majors. Basic principles of inorganic chemistry including measurements; unit conversions; atomic theory; periodic properties; bonding; inorganic nomenclature; chemical equations; stoichiometry; nuclear chemistry; gas laws; states of matter; solutions; acids, bases, and buffers. **Prerequisite:** MATH BA with a grade of "C" or better or high school algebra; MATH prerequisite accomplished within the previous 2 years; Reading Level 5 or 6. **Hours:** (144) 2 lect, 4 lab, 2 disc. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges.

CHEM B16 Principles of Organic Chemistry and Biochemistry (3 units)

Designed for associate degree nursing and allied-health majors. Basic principles of organic chemistry, including nomenclature, and chemical and physical properties of the major functional groups. Basic principles of biochemistry including carbohydrates, lipids, proteins, enzymes, nucleic acids and metabolism. **Prerequisite:** CHEM B15 or CHEM B2a with a grade of "C" or better. **Hours:** (90) 2 lect, 2 lab, 1

disc. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges.

CHEM B49 Applied Chemistry (4 units)

The systematic study of the principles of applied inorganic, organic, and biochemistry using a qualitative and quantitative approach. Topics include physical principles of chemistry; inorganic compounds and reactions; basic and applied nuclear chemistry, (including radioactivity, nuclear energy, uses of radioisotopes, radiation hazards); a survey of organic chemistry (classification, compounds, reactions, nomenclature); biochemistry (classification, composition, reactions in living organisms). The course emphasizes technical aspects of chemistry relating to everyday processes and industrial and environmental applications. **Prerequisite:** MATH BA or equivalent. **Recommended:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 1 disc, 2 lab. Field trips may be required. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges. **Note:** Not open to students with credit in ENVT B49.

ENGINEERING

Credit limitations may apply. For specific information see a counselor.

ENGR B17 Introduction to Electric Circuits (3 units)

Principles and techniques of D.C. and A.C. circuit analysis, including Kirchoff's laws, mesh and nodal analysis, Thevenin's and Norton's theorems, impedance, phasors, frequency response, power calculations, natural and forced responses, analog building blocks, operational amplifiers, and Laplace transform. **Prerequisites:** PHYS B4b. **Recommended:** MATH B6d (may be taken concurrently). **Hours:** (72) 3 lect, 1 disc. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN ENGR 12)

ENGR B19f/B19p/B19c Computer Programming for Science, Engineering and Technology (3-3-3 units)

Methods used in the solution of science and engineering problems on digital computers. Programming of algorithms for solutions of numerical problems using a higher level language. ENGR B19f uses the Fortran language, while ENGR B19p utilizes the Pascal programming language. The C programming language is taught in ENGR B19c. **Prerequisite:** MATH B6a (may be taken concurrently). **Recommended:** Reading Level 5 or 6. **Hours:** (54) 3 lect. **Offered:** F. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

ENGR B24 Engineering Graphics and Descriptive Geometry (2 units)

Orthographic projection, auxiliary views, sectioning, threads and fasteners, dimensioning, tolerance, and working drawing. Descriptive geometry used to obtain points, lines, planes, intersections, developments and spatial relationships. Instrument and computer aided drafting systems used as aid to

visualization and design. **Prerequisites:** INDR B10, INDR B11 and MATH BC or higher. **Recommended:** Reading Level 5 or 6. **Hours:** (72) 1 lect, 3 lab. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN ENGR 2)

ENGR B36 Engineering Mechanics - Statics (3 units)

Principles of statics and their application to engineering problems, equilibrium of two-dimensional and three-dimensional systems of particles and rigid bodies. Concentrated and distributed force systems, structures, friction, virtual work and moments of inertia. **Prerequisites:** PHYS B4a, MATH B6a. **Hours:** (54) 3 lect. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN ENGR 8)

ENGR B37 Engineering Mechanics-Dynamics (3 units)

Fundamental principles of motions of particles and rigid bodies and their application to engineering problems. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Mathematical modeling and analysis of mechanical systems. Vector mathematics will be used as appropriate. **Prerequisites:** ENGR B36 and MATH B6c. **Hours:** (54) 3 lect. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and Private Colleges.

ENGR B45 Properties of Materials (3 units)

Internal structure of engineering materials. Characteristics of single and multiple phase metals; polymer, ceramics and composite materials. Mechanical, thermal, chemical, electrical and radiation behavior of engineering materials. Laboratory investigation of the physical properties of metals, wood, soils, and concrete, and polymers. **Prerequisites:** MATH BC and CHEM B1a and PHYS B4a or CHEM B2a and PHYS B2a. **Hours:** (90) 2 lect, 3 lab. **Offered:** F. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN ENGR 4)

ENGR B48 Engineering Orientation (1 unit)

Survey of engineering as a profession. All branches discussed with respect to career opportunities, educational requirements, development of a personal education plan. Satisfies 0.5 unit educational planning requirement for graduation from Bakersfield College. **Recommended:** MATH BA, Reading Level 5 or 6. **Hours:** (18) 2 lect for 9 weeks. Field trips required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges.

ENGR B49 Engineering Analysis and Design (1 unit)

Introduction to the engineering design process and to the mathematical, scientific, and computational skills required to solve engineering problems. Students will design and construct a project. **Prerequisite:** MATH B6a (may be taken concurrently). **Recommended:** ENGR B48, Reading Level 5 or 6. **Hours:** (18) 2 lect for 9 weeks. **Offered:** F. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges.

GEOGRAPHY

GEOG B1 Physical Elements of Geography (3 units)

A study of the basic elements of physical geography; climate, land forms, soils, natural vegetation and their patterns of world distribution. **Recommended:** Reading Level 5 or 6. **Hours:** (54) 3 lect. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN GEOG 2)

GEOG B1L Physical Geography Laboratory (1 unit)

Laboratory assignments designed to accompany GEOG B1 lectures. Maps and mapping, location analysis, earth-sun relationship, weather and climate statistical and regional analysis, topographic maps and landform building processes. Emphasis on spatial relationships of physical environmental elements. **Recommended:** Reading Level 5 or 6, GEOG B1 (may be taken concurrently). **Hours:** (54) 2 lab, 1 quiz/demo. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

GEOG B2 Human Geography (3 units)

Introduction to concepts and tools of human geography including origin of cultural landscapes, human modification of natural environments and spatial distribution of population, languages, religions, agriculture, urbanization and industrialization, and political systems. **Recommended:** Reading Level 5 or 6. **Hours:** (54) 3 lect. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges.

GEOLOGY

Credit limitations may apply. For specific information see a counselor.

GEOL B1a Physical Geology (4 units)

An introduction to the principles of geology with emphasis on the structure and origin of the earth, its present and past landscapes and the processes at work changing its surface. Includes identification of rocks and minerals, topographic and geologic map exercises demonstrating the work of water, wind, ice and gravity and effects of volcanism and earthquakes. **Prerequisite:** Reading Level 5 or 6. **Hours:** (108) 3 lect, 3 lab. At least 1 Saturday field trip or equivalent required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. **Note:** Not open to students who have taken the equivalent course, GEOL B10 and B10L.

GEOL B10 Introduction to Geology (3 units)

An introduction to the principles of geology with emphasis on the structure and origin of the earth, its present and past landscapes and the processes at work changing its surface. Students desiring laboratory experience should either substitute GEOL B1a or enroll in GEOL B10L concurrently with GEOL B10. **Prerequisite:** Reading Level 5 or 6. **Hours:** (54) 3 lect. At least one Saturday field trip or equivalent required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:**

UC, CSU and private colleges. **Note:** Not open to students who have taken GEOL B1a.

GEOL B10L Introductory Geology Laboratory (1 unit)

Exercises planned to accompany the lectures of GEOL B10. Identification of rocks and minerals, topographic and geologic map exercises demonstrating the work of water, wind, ice and gravity and effects of volcanism and earthquakes. Designed for students preparing to teach in the elementary grades and for all non-science majors. **Recommended:** Reading Level 5 or 6, concurrent enrollment in GEOL B10. **Hours:** (54) 3 lab. Field trip required. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

GEOL B12 Geology of California (3 units)

An elementary course dealing with the geologic history, structure, topography and mineral resources of California and adjoining areas. **Prerequisites:** GEOL B1a or GEOL B10. **Hours:** (54) 3 lect. One field trip or equivalent required. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

GEOL B35a Rocks and Minerals (1 unit)

A study of rocks and minerals. Students will learn to identify the major rock-forming minerals and to recognize their relationships as components of the various classes of rocks. From the identification of rocks, recognition of the environmental conditions of deposition will follow. Field work will allow the examination of the field relationships of various rocks and the beginning of a collection of rock and mineral specimens. **Recommended:** Reading Level 5 or 6. **Hours:** (18) 9 lect/lab for 2 weeks. Field trip required. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges.

GEOL B35b Geology of Kern County (1 unit)

A study of the geologic history and landforms of Kern County, and the geologic forces and processes that created them. As part of this course, students will learn about many of the different rocks and minerals of Kern County, tectonic activity and mountain building, volcanic activity, earthquakes and weathering. From materials presented, students will be able to understand the geologic forces that shaped Kern County. A field trip is required which will permit the examination and recognition of different geological environments. **Recommended:** Reading Level 5 or 6. **Hours:** (18) 9 lect for 2 weeks. Field trip required. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges.

PHYSICAL SCIENCE

Credit limitations may apply. For specific information see a counselor.

PHSC B11 General Physical Science (4 units)

A survey of the basic physical phenomena of mechanics, heat, light, sound, electricity, chemistry, geology, meteorology, and astronomy. Emphasizes basic principles, relationships, status

and applications to modern civilization. Topics are developed with a minimum of mathematical presentation. Designed for all non-science, industrial technology and education majors. **Recommended:** Reading Level 5 or 6. **Hours:** (108) 3 lect/demo/disc, 3 lab. **Offered:** F, S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges.

PHSC B35e Cup and Saucer Chemistry (1 unit)

An inexpensive approach to studying chemical happenings. Emphasizes a "hands on" approach to doing and developing experience in chemistry that leads to an understanding of investigation, Metric, particle nature of matter, energy and the shape of things. **Recommended:** Reading Level 5 or 6. **Hours:** (18) 9 lect/disc for 2 weeks. **CCS:** Liberal Arts & Sciences. **Transferable:** CSU and private colleges.

PHSC B248ab Cooperative Work Experience Education (1-8 units. Limit 16 units)

See WEXP 248ab description.

PHSC B249ab Cooperative Work Experience Education (1-4 units. Limit 16 units)

See WEXP 249ab description.

PHYSICS

Credit limitations may apply. For specific information see a counselor.

The introductory courses in Physics (Physics B2a-B2b or B4a-4c) and Chemistry (Chemistry B11, B2a or B1a-B1b) are designed to provide the basic foundation in and understanding of the laws and principles of the physical world (matter and energy) for all science, health science, and pre-professional majors. These courses should be completed early in a student's academic program sequence of study to ensure greater academic success in subsequent courses in the student's field of interest and a more complete understanding of that field.

PHYS B2a General Physics - Mechanics and Heat (4 units)

The properties of matter, mechanics and heat. Emphasizes understanding laws, principles, and theories. Required for most science, pre-medical, most other pre-professional and technical majors. **Prerequisites:** MATH BD, MATH BC (may be taken concurrently). **Recommended:** Reading Level 5 or 6. **Hours:** (126) 4 lect, 3 lab. **Offered:** F. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN PHYS 2) (PHYS B2a + B2b = CAN PHYS SEQ A)

PHYS B2b General Physics – Sound, Light, Electricity, Magnetism, Modern Physics (4 units)

The properties of waves, sound, light, electricity, magnetism, atomic and nuclear physics. Emphasizes understanding laws, principles and theories. Required for most science, pre-medical, most other pre-professional and technical majors. **Prerequisites:** MATH BC and MATH BD, PHYS B2a, or

high school physics with a “C.” **Hours:** (126) 4 lect, 3 lab.
Offered: S. **CCS:** Liberal Arts & Sciences. **Transferable:**
UC, CSU and private colleges. (CAN PHYS 4) (PHYS B2a +
B2b = CAN PHYS SEQ A)

PHYS B4a Mechanics and Wave Motion (4 units)

The first in a sequence of three semester courses required of physics, engineering, and other majors requiring a thorough physics background. Includes vectors, kinematics, dynamics, momentum, energy, rotation, gravitation, oscillations, fluids, and wave motion. **Prerequisite:** MATH B6a. **Recommended:** Reading Level 5 or 6. **Hours:** (126) 3 lect, 1 disc, 3 lab. **Offered:** S. **CCS:** Liberal Arts & Sciences. **Transferable:** UC, CSU and private colleges. (CAN PHYS 8) (PHYS B4a + B4b + B4c = CAN PHYS SEQ B)

PHYS B4b Heat, Electricity and Magnetism (4 units)

The second in a three-semester calculus-based physics sequence required of physics, engineering, and other majors requiring a thorough physics background. Includes thermodynamics, electricity, magnetism, and electromagnetic oscillations and radiation. Emphasizes principles, laws and problem-solving. **Prerequisite:** PHYS B4a and concurrent enrollment in MATH B6c. **Hours:** (126) 3 lect, 1 disc, 3 lab. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges. (CAN PHYS 12) (PHYS B4a + B4b + B4c = CAN PHYS SEQ B)

PHYS B4c Optics and Modern Physics (4 units)

The third in a 3-semester calculus-based physics sequence required of physics, engineering and other majors requiring a thorough physics background. Includes geometric optics, relativity, quantum physics, quantum mechanics, atomic and molecular physics, solid state physics, and nuclear physics. Emphasizes principles, laws, and problem solving. **Prerequisite:** PHYS B4b. **Recommended:** Concurrent enrollment in MATH B6d. **Hours:** (126) 3 lect, 3 lab, 2 disc. **CCS:** Liberal Arts and Sciences. **Transferable:** UC, CSU and private colleges. (CAN PHYS 14) (PHYS B4a + B4b + B4c = CAN PHYS SEQ B)