

Department of Physical Sciences



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The Department of Physical Sciences offers the following degrees and majors: B.S. Chemistry — ACS Certified, B.S. Chemistry, B.S. Chemistry Biochemistry emphasis, B.S. Geology, B.A. Geology, B.S. Physics; minors in Chemistry, Chemical Physics, Environmental Geology, Geochemistry, Geology, Geophysics, Physics and Teaching of Natural Science. Courses offered in the Department are under the following subject codes: CHEM, GEOL, PHYS and PHSC.

Chemistry

The Chemistry program is approved by the American Chemical Society (ACS). It offers a Biochemistry Major and a Chemistry Major with two degree plans: Plan I is the ACS certified degree which prepares a student to pursue graduate studies in chemistry and related fields or to enter industry. Plan II, not certified by the ACS, allows a student more flexibility to select electives. For example, a pre-med student may choose either Plan I or Plan II and should seek advice from a pre-med advisor. A student may choose Plan II for a Chemistry/Biology double major. A student who wants to work in the business side of the chemical and allied industries may want to take Plan II with a number of business electives. A student who plans to be a secondary chemistry teacher may take Plan II with the General Education Requirements for teachers on Page 45 and the Science Licensure requirements on Page 47. A student may obtain honors credit for General Chemistry I and II (CHEM 151–152) by enrolling concurrently in the optional honors seminar classes (CHEM 151H and 152H). Descriptions for CHEM courses begin on Page 113.

In addition to the degree programs listed here, qualified undergraduates may apply to the Graduate school beginning with the last semester of the Junior year to take graduate courses for credit at the 500 level (to be counted toward an M.S. in chemistry). For further details, see the *Graduate Catalog*.

Students in a major with licensure will complete the teaching degree General Education requirements as found on Page 45 and the professional education requirements listed on Page 47.

Chemistry Core Requirements (25 hours)

CHEM	151/L	General Chemistry I (4)
CHEM	152/L	General Chemistry II (4)
CHEM	233/L	Quantitative Analysis (4)
CHEM	321/L	Inorganic Chemistry (4)
CHEM	341/L	Organic Chemistry I (4)
CHEM	342/L	Organic Chemistry II (4)
CHEM	492	Undergraduate Seminar (1)

Degree: Bachelor of Science (BS)

Major: Biochemistry

Chemistry Core Requirements, plus

CHEM	401/L	Biochemical Methods (2)
CHEM/		
PHYS	411/L	Physical Chemistry/ Thermodynamics (4)
CHEM	450	Instrumental Analysis (4)
CHEM	452	Biochemistry (3)
CHEM	453	Advanced Biochemistry (3)
CHEM	470	Investigative Problems (1–4) (must take at least 3 hours)
CHEM	493	Special Topics (1-3)
CHEM	495	Senior Chemistry Review (1)
Required courses in related areas (30 hours)		
BIOL	151/L	General Biology I (4)
BIOL	152/L	General Biology II (4)
MATH	124	Calculus I (4)
MATH	132	Calculus II (4)
PHYS	151/L	General Physics (4) AND
PHYS	152/L	General Physics (4) OR
PHYS	201/L	Physics I (5) AND
PHYS	202/L	Physics II (5)
6 hours from the following courses:		
BIOL	214/L	Microbiology (4)
BIOL	222	Cell Biology (3)
BIOL	231	Genetics (3)

Degree: Bachelor of Science (BS)

Major: Chemistry (ACS Certified) — Plan I

Chemistry Core Requirements, plus

CHEM/		
PHYS	411/L	Physical Chemistry/ Thermodynamics (4)
CHEM	412/L	Physical Chemistry/ Quantum Mechanics (4)
CHEM	450	Instrumental Analysis (4)
CHEM	452	Biochemistry (3)
CHEM	470	Investigative Problems (1–4) (must take at least 3 hours)
CHEM	495	Senior Chemistry Review (1)
6 hours upper-division chemistry electives		
Required courses in related areas (20–22 hours)		
MATH	124	Calculus I (4)
MATH	132	Calculus II (4)
MATH	202	Calculus III (4)
PHYS	151/151L	General Physics (4) AND
PHYS	152/152L	General Physics (4) OR
PHYS	201/201L	Physics I (5) AND
PHYS	202/202L	Physics II (5)

Degree: Bachelor of Science (BS)

Major: Chemistry — Plan II

Chemistry Core Requirements, plus

CHEM	450	Instrumental Analysis (4)
CHEM	495	Senior Chemistry Review (1)
3 hours upper-division electives		
Required courses in related areas (6–7 hours)		
MATH	119	College Algebra (3)
MATH	124	Calculus I (4) OR
A computer language course		

Degree: Bachelor of Science (BS)**Major: Chemistry****Licensure: Secondary Science**

Requires minor of Teaching Natural Science

Courses that must be chosen within the Teaching Degree**General Education Requirements:**

Fulfill the 12-hour science requirement by taking the following:

BIOL 152/L General Biology II (4)

GEOL 151/L Physical Geology (4)

GEOL 152/L Historical Geology (4)

Fulfill the 6-hour math requirement by taking the following:

MATH 119 College Algebra (3)

MATH 124 Calculus I (4) **OR**

STAT 213 Statistical Methods I (4)

Professional Education Requirements (30 hours), see Page 47**Chemistry Core Requirements, plus**

CHEM 452 Biochemistry (3)

In addition, select one of the following:

CHEM 401/L Biochemical Methods (2)

CHEM 411/L Physical Chemistry/
Thermodynamics (4)CHEM 412/L Physical Chemistry/
Quantum Mechanics (4)

CHEM 450 Instrumental Analysis (4)

Minor: Chemistry**Chemistry Course Requirements (20 hours)**

CHEM 151/L General Chemistry I (4)

CHEM 152/L General Chemistry II (4)

CHEM 341/L Organic Chemistry I (4)

CHEM 342/L Organic Chemistry II (4)

CHEM 233/L Quantitative Analysis (4), **OR**CHEM 321 L Inorganic Chemistry (4), **OR**CHEM 401/L Biochemical Methods (2), **OR**CHEM 411/L Physical Chemistry/
Thermodynamics (4), **OR**CHEM 412/L Physical Chemistry/
Quantum Mechanics (4), **OR**CHEM 450 Instrumental Analysis (4), **OR**

CHEM 452 Biochemistry (3)

Minor: Geochemistry**Major in Geology.****Chemistry Course Requirements (19 hours)**

CHEM 151/L General Chemistry I (4)

CHEM 152/L General Chemistry II (4)

CHEM 233/L Quantitative Analysis (4)

CHEM 321/L Inorganic Chemistry (4)

CHEM/

GEOL 454 Geochemistry (3)

Minor: Teaching of Natural Science**(To be used for Secondary Science Licensure Chemistry major)****Teaching Requirements (10 hours)**

BIOL 439 Teaching in Biology (1)

CHEM 439 Teaching in Chemistry (1)

GEOL 439 Teaching in Geology (1)

PHYS 439 Teaching in Physics (1)

SED 380 Secondary School Teaching/Learning (3)

SED 410 Issues in Secondary Teaching (3)

Additional Science Courses (16 hours)

BIOL 151/L General Biology I (4)

PHYS 151/L General Physics (4)

PHYS 152/L General Physics (4)

BIOL 214/L Microbiology (4)

Subject Matter Endorsement**Area/Minor: General Science****Licensure: Elementary**

Up to 12-hours of science coursework taken as part of the general education requirements may apply to the endorsement. Students must take the 151/L courses. See advisor to assist with the selection of electives.

Required Courses (16 hours):

BIOL 151/L General Biology I (4)

CHEM 151/L General Chemistry I (4)

GEOL 151/L Physical Geology (4)

PHYS 151/L General Physics (4)

Electives (8 hours)

BIOL 214/L Microbiology* (4)

BIOL 216 General Botany* (3)

GEOL 410 Environmental Geology* (3)

GEOL 482 Geology of New Mexico* (2)

GEOL 484 Geology of Western National Parks (3)

PHYS 141/L Astronomy (4)

Students wishing to pursue middle school licensure must take 12 of upper division courses (300/400-level). Other science courses with prior consent of advisor.

*Requires prerequisites or consent of instructor.

Bachelor of Science/Master of Science (BS/MS) Plan

Qualified students entering the ENMU chemistry program at the undergraduate level will be allowed to apply to the Graduate School during the last semester of the junior year to take a limited number of graduate courses for credit at the 500 level. These courses will be above, and in addition to the required coursework for the bachelor's degree. Admission to the BS/MS plan will be based on a review of academic performance through the junior year. Upon receipt of the bachelor's degree and admission to the graduate program, those 500 level courses will be counted toward the graduate degree program thereby allowing students to complete both the B.S., and M.S. degrees in five to five and a half years instead of the normal six to seven years.

Sample Program of Study in the Plan II Chemistry Major

Below is a suggested sequence of courses for the major listed. *This is not an official degree plan.* For specific information, see advisor.

*Either Calculus I or a computer language (CS 113, CS 123 not acceptable).

Suggested programs of study for other programs in Chemistry can be obtained from advisors.

Freshman Year			Fall	Spring
CHEM	151/L	General Chemistry I	4	
CHEM	152/L	General Chemistry II		4
ENG	102	English Composition	3	
MATH	119	College Algebra	4	
ENG	104	English Comp and Research		3
MATH	124	Calculus I		4
		Physical Education	1	1
UNIV	101	Freshman Seminar	3	
		General Education electives	2	5
Total credit hours			17	17

Sophomore Year			Fall	Spring
CHEM	233/L	Quantitative Analysis		4
CHEM	341/L	Organic Chemistry I	4	
CHEM	342/L	Organic Chemistry II		4
COMM	101/L	Interpersonal Communication	3	
		*Computer Science elective	3	
		Humanities/Fine Arts		3
		Electives	6	6
Total credit hours			16	17

Junior Year			Fall	Spring
CHEM	321/L	Inorganic Chemistry	4	
		Social Science electives	6	
		Humanities or Fine Arts electives		6
		Electives	6	10
Total credit hours			16	16

Senior Year			Fall	Spring
CHEM	450	Instrumental Analysis	4	
CHEM	492	Undergraduate Seminar		1
CHEM	495	Senior Chemistry Review	1	
		Electives	12	15
Total credit hours			17	16

Geology

The Geology program is recognized by the American Institute of Professional Geologists as meeting or exceeding the Institute's guidelines for undergraduate programs in geology. The Bachelor of Science degree program with a Geology major prepares a student for graduate study and a professional career in geology. Because specialization is best undertaken at the graduate level, this program stresses basic geologic principles and a strong science and math background as a firm foundation for further study and experience. Students majoring in geology are strongly recommended to select a minor from the fields of biology, chemistry, geochemistry, mathematics or physics.

The Bachelor of Arts degree program with a Geology major is designed for the student who wishes to study geology as a liberal arts program but who does not intend to become a professional geologist. Without additional mathematics and related science courses, this program will not normally allow a student to take graduate training in geology or find professional employment in geology; instead, the BA program offers a broad view of the earth and provides an academic background necessary for pursuit in fields indirectly related to geology.

The student who plans to teach secondary school science in New Mexico may satisfy Secondary Science Licensure requirements by choosing the Bachelor of Science degree, Geology major with Secondary Science Licensure. These students should check the General Education Requirements for teachers on Page 45 and Science Licensure requirements on Page 47. Descriptions for GEOL courses begin on Page 129.

Students in a major with licensure will complete the teaching degree General Education requirements as found on Page 45 and the professional education requirements listed on Page 47.

Geology Core Requirements (20 hours)

GEOL	151/L	Physical Geology (4)
GEOL	152/L	Historical Geology (4)
GEOL	302/L	Invertebrate Paleontology (4)
GEOL	303/L	Crystallography-Mineralogy (4)
GEOL	351/L	Petrology (4)

Degree: Bachelor of Science (BS)

Major: Geology

Geology Core Requirements, plus

GEOL	311/L	Stratigraphy and Sedimentation (4)
GEOL	312/L	Structural Geology (4)
GEOL	454	Geochemistry (3)
GEOL	465	Senior Research Project (2)

Select one upper-division GEOL elective (3–4 hours).

An off-campus geology summer field camp (similar to GEOL 424) with a minimum credit of 6 hours is also required. The field course chosen by the student **must** be approved by the Geology staff before the student enrolls. Information on field camps should be obtained during the fall semester and enrollment in the program should be attempted early in the spring preceding the summer of the field course matriculation. Students should plan financial arrangements for the field camp as early as possible prior to enrollment in the field course. Financial aid is sometimes available for the summer course through outside funding agencies but early application is essential. The geology summer camp taught by the department, if taken in the final 32 hours, will count for part of the 32-hour residency requirement.

Required courses in related areas (29–31 hours)

CHEM	151/L	General Chemistry I (4)
CHEM	152/L	General Chemistry II (4)
PHYS	151/L	General Physics (4), AND
PHYS	152/L	General Physics (4) OR
PHYS	201/L	Physics I (5) AND
PHYS	202/L	Physics II (5)
MATH	120	Plane Trigonometry (3)
MATH	124	Calculus I (4)
STAT	213	Statistical Methods I (4)
STAT	313	Statistical Methods II (3) OR
MATH	132	Calculus II (4)

Degree: Bachelor of Science (BS)**Major: Geology****Licensure: Secondary Science****Courses that must be chosen within the Teaching Degree****General Education Requirements:**

Fulfill the 12-hour science requirement by taking the following:

BIOL	152/L	General Biology II (4)
PHYS	151/L	General Physics (4)
PHYS	152/L	General Physics (4)

Fulfill the 6-hour math requirement by taking the following:

MATH	120	Plane Trigonometry (3)
STAT	213	Statistical Methods I (4)

Geology Core Requirements, plus

GEOL	424	Geology Summer Field Camp (8)
PHYS	141/L	Astronomy (4)

In addition select one of the following:

GEOL	304/L	Geomorphology (4)
GEOL	311/L	Stratigraphy and Sedimentation (4)
GEOL	312/L	Structural Geology (4)
GEOL	410	Environmental Geology (3)
GEOL	454	Geochemistry (3)

Degree: Bachelor of Arts (BA)**Major: Geology****Geology Core Requirements, plus**

GEOL	311/L	Stratigraphy and Sedimentation (4)
GEOL	312/L	Structural Geology (4)

Two upper-division courses in geology (6–8 hours)

An off-campus geology summer field camp (6 hours minimum)

See above for full explanation.

Required courses in related areas (18 hours)

PHYS	113	Survey of Physics (3)
BIOL	113	Biology for General Education (3)
GEOL/		
ANTH	103	Humans and Their Environments (3)
ANTH	111	The Dawn of Humanity (3)
MATH	120	Plane Trigonometry (3)
STAT	115	Introduction to Statistics and Computer Programming (3)

Minor: Environmental Geology**Geology Course Requirements (14 hours)**

GEOL	113/L	The Geological Environment (4) OR
GEOL	151/L	Physical Geology (4)
GEOL	123/L	Earth Resources (4)
GEOL	410	Environmental Geology (3)
GEOL	420	Environmental Geochemistry (3) OR
GEOL	454	Geochemistry (3)

Additional Science Courses (8 hours)

AG	204/L	Soil Science (3) OR
GEOL	311/L	Stratigraphy and Sedimentation (4)
BIOL	303/L	General Ecology (4)

Minor: Geochemistry**Requires a Major in Chemistry.****Geology Course Requirements (19 hours)**

GEOL	151/L	Physical Geology (4)
GEOL	303/L	Crystallography-Mineralogy (4)
GEOL	351/L	Petrology (4)
GEOL	417/L	Economic Geology (4)
GEOL	454	Geochemistry (3)

Minor: Geophysics**Requires a Major in Physics.****Geology Course Requirements (20 hours)**

GEOL	151/L	Physical Geology (4)
GEOL	152/L	Historical Geology (4)
GEOL	311/L	Stratigraphy and Sedimentation (4)
GEOL	312/L	Structural Geology (4)
GEOL	450/L	Principles of Geophysics (4)

Minor: Geology**Geology Course Requirements (17 hours)**

GEOL electives to be coordinated with student's major field and approved by geology advisor

Minor: Teaching of Natural Science**(To be used for Secondary Science Licensure with the Geology major)**

BIOL	439	Teaching in Biology (1)
CHEM	439	Teaching in Chemistry (1)
GEOL	439	Teaching in Geology (1)
PHYS	439	Teaching in Physics (1)
SED	380	Secondary School Teaching/Learning (3)
SED	410	Issues in Secondary Teaching (3)
BIOL	151/L	General Biology I (4)
BIOL	214/L	Microbiology (4)
CHEM	151/L	General Chemistry I (4)
CHEM	152/L	General Chemistry II (4)

Subject Matter Endorsement**Area/Minor: General Science****Licensure: Elementary****Up to 12-hours of science coursework taken as part of the general education requirements may apply to the endorsement. Students must take the 151/L courses. See advisor to assist with the selection of electives.****Required Courses (16 hours):**

BIOL	151/L	General Biology I (4)
CHEM	151/L	General Chemistry I (4)
GEOL	151/L	Physical Geology (4)
PHYS	151/L	General Physics (4)

Electives (8 hours)

BIOL	214/L	Microbiology* (4)
BIOL	216	General Botany* (3)
GEOL	410	Environmental Geology* (3)
GEOL	482	Geology of New Mexico* (2)
GEOL	484	Geology of Western National Parks (3)
PHYS	141/L	Astronomy (4)

Students wishing to pursue middle school licensure must take 12 of upper division courses (300/400-level). Other science courses with prior consent of advisor.

*Requires prerequisites or consent of instructor.

GEOL	482	Geology of New Mexico* (2)
GEOL	484	Geology of Western National Parks (3)
PHYS	141/L	Astronomy (4)

Sample Program of Study in Geology for Bachelor of Science (BS) Degree

Below is a suggested sequence of courses for the major listed. *This is not an official degree plan.* For specific information, see advisor.

*GEOL 324 Regional Field Geology is not required, but the field experience is strongly recommended and the course may be repeated for up to 4 hours of credit. A Summer Field Camp similar to GEOL 424 is taken in addition to the listed courses. This course should be taken any time after the second year when possible.

Freshman Year			Fall	Spring
GEOL	151/L	Physical Geology	4	
GEOL	152/L	Historical Geology		4
GEOL	324	*Regional Field Geology		1
CHEM	151/L	General Chemistry I	4	
		102 or		
ENG	108	English Composition	3	
COMM	101/L	Interpersonal Communication	3	
CHEM	152/L	General Chemistry II		4
		104 or		
ENG	109	English Comp and Research		3
		HPE elective	1	1
		Fine Arts elective		3
Total credit hours			15	16

Sophomore Year			Fall	Spring
GEOL	303/L	Crystallography-Mineralogy	4	
PHYS	151/L	General Physics	4	
MATH	124	Calculus I	4	
PHYS	152/L	General Physics		4
MATH	132	Calculus II		4
GEOL	324	*Regional Field Geology		1
GEOL	351/L	Petrology		4
		Social Science elective	3	3
		Life Science elective	3	
Total credit hours			18	16

Junior Year			Fall	Spring
GEOL	302/L	Invertebrate Paleontology	4	
STAT	213	Statistical Methods I	4	
GEOL	311/L	Stratigraphy & Sedimentation		4
GEOL	312/L	Structural Geology		4
GEOL	324	*Regional Field Geology		1
		Humanities elective		3
		Humanities/Fine Arts elective	3	
		Electives or minor	6	4
Total credit hours			17	16

Senior Year			Fall	Spring
GEOL	465	Senior Research Project	2	
GEOL	324	*Regional Field Geology		1
GEOL	454	Geochemistry		3
		Social Science elective	4	
		Elective or minor	8	12
Total credit hours			14	16

Physical Sciences

At ENMU, Physical Science courses are offered as service courses to the General Education program and those majors requiring or recommending its use. Descriptions for PHSC courses begin on Page 141.

Physics

Note: There are temporarily no admissions to the physics program. The following information is applicable to current majors and minors only.

Two major programs are offered for the student in physics. The Physics major (Graduate School Preparation) prepares the student for graduate study in physics and related areas. The Physics major (Applications Preparation) prepares the student for a technical position in many fields of science and technology. The curriculum in both programs emphasizes basic principles and practical laboratory experience with opportunity for working on individual projects and research problems. Some latitude of choice among required courses and electives allows the student to explore related fields and to concentrate on either theoretical or applied physics courses.

A Physics major should plan to start introductory physics and calculus no later than the sophomore year. The physics student should be aware that the introductory physics courses begin only in the fall semester and that most upper-division courses are offered every other year. A student majoring in physics should select a minor in mathematics, computer science, chemistry, geology or biology.

The student who plans to teach secondary school science in New Mexico may satisfy Secondary Science Licensure requirements by choosing the Bachelor of Science degree, Physics major with Secondary Science Licensure. These students should check the General Education Requirements for teachers listed on Page 45 and Science Licensure requirements listed on Page 47. Descriptions of PHYS courses begin on Page 141.

Students in a major with licensure will complete the teaching degree General Education requirements as found on Page 45 and the professional education requirements listed on Page 47.

Physics Core Requirements (16–18 hours)

PHYS	151/L	General Physics (4) AND
PHYS	152/L	General Physics (4)
PHYS	201/L	Physics I (5) AND
PHYS	202/L	Physics II (5) OR
		(preferably 201/202 sequence)
PHYS	301	Modern Physics (3)
PHYS	303	Mechanics I (3)
PHYS	305L	Advanced Physics Laboratory (2)

Degree: Bachelor of Science (BS) Major: Physics (Graduate School Preparation)

Physics Core Requirements, plus

PHYS	304	Mechanics II (3)
PHYS	411	Physical Chemistry I/Thermodynamics (3)
PHYS	421	Electricity and Magnetism (3)
PHYS	435	Quantum Physics (3)
PHYS	465	Senior Research Report (2)
Upper-division PHYS electives (5–7)		

Course Requirements in Related Areas (15 hours)

MATH	124	Calculus I (4)
MATH	132	Calculus II (4)
MATH	202	Calculus III (4)
One programming language course (3)		

Electives (21 hours)

The following courses are recommended as electives:

MATH	351	Ordinary Differential Equations (3)
MATH	352	Introduction to Linear Algebra (3)
MATH	407	Introduction to Complex Variables (3)
MATH	409	Numerical Analysis I (3)
MATH	423	Partial Differential Equations I (3)
ENG	325	Professional and Technical Writing (3)

Courses in Programming, Chemistry

Degree: Bachelor of Science (BS)
Major: Physics (Applications Preparation)

Physics Core Requirements, plus

PHYS	304	Mechanics II (3)
PHYS	331/L	Optics (4)
PHYS	411	Physical Chemistry I/Thermodynamics (3)
PHYS	465	Senior Research Report (2)

Upper-division PHYS electives (3–5)

Course Requirements in Related Areas (18 hours)

MATH	124	Calculus I (4)
MATH	132	Calculus II (4)
MATH	202	Calculus III (4)

One programming course (3)

EET	241/L	Logic Circuits (3)
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Electives (24–27 hours)

The following elective courses are recommended:

ENG	325	Professional and Technical Writing (3)
MATH or CHEM or BUS courses		

Degree: Bachelor of Science (BS)**Major: Physics****Licensure: Secondary Science**

Courses that must be chosen within the Teaching Degree

General Education Requirements:

Fulfill the 12-hour Science requirement by taking the following:

BIOL	152/L	General Biology II (4)
GEOL	151/L	Physical Geology (4)
GEOL	152/L	Historical Geology (4)
MATH	124	Calculus I (4), (requires MATH 119)

Physics Core Requirements, plus

PHYS	113/L	Survey of Physics (4)
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Upper-division PHYS electives

Minor: Chemical Physics

Requires professional major in chemistry

Physics Course Requirements (16 hours)

PHYS	303	Mechanics I (3)
PHYS	304	Mechanics II (3)
PHYS	331/L	Optics (4)
PHYS	421	Electricity and Magnetism (3)
PHYS	435	Quantum Physics (3)

Minor: Geophysics

Requires a major in geology.

Physics Course Requirements (17–19 hours)

PHYS	151/L	General Physics (4) AND
PHYS	152/L	General Physics (4) OR
PHYS	201/L	Physics I (5) AND
PHYS	202/L	Physics II (5)
PHYS	303	Mechanics I (3) (requires MATH 124)
PHYS	305L	Advanced Physics Laboratory (2)
PHYS	450/L	Principles of Geophysics (4)

Minor: Physics**Physics Course Requirements (22 hours)**

PHYS	151/L	General Physics (4) AND
PHYS	152/L	General Physics (4) OR
PHYS	201/L	Physics I (5) AND
PHYS	202/L	Physics II (5)
PHYS	301	Modern Physics (3)
PHYS	303	Mechanics I (3)
PHYS	305L	Advanced Physics Laboratory (2)
PHYS electives (4–6)		

Course Requirements in Related Areas (8 hours)

MATH	124	Calculus I (4)
MATH	132	Calculus II (4)

Minor: Teaching of Natural Science
(to be used for Secondary Science
Licensure with the Physics major)

Teaching Requirements (10 hours)

BIOL	439	Teaching in Biology (1)
CHEM	439	Teaching in Chemistry (1)
GEOL	439	Teaching in Geology (1)
PHYS	439	Teaching in Physics (1)
SED	380	Secondary School Teaching/Learning (3)
SED	410	Issues in Secondary Teaching (3)

Additional Science Courses (16 hours)

BIOL	151/L	General Biology I (4)
BIOL	214/L	Microbiology (4)
CHEM	151/L	General Chemistry I (4)
CHEM	152/L	General Chemistry II (4)
(Some courses require prerequisites.)		

Subject Matter Endorsement**Area/Minor: General Science****Licensure: Elementary**

Up to 12-hours of science coursework taken as part of the general education requirements may apply to the endorsement. Students must take the 151/L courses. See advisor to assist with the selection of electives.

Required Courses (16 hours):

BIOL	151/L	General Biology I (4)
CHEM	151/L	General Chemistry I (4)
GEOL	151/L	Physical Geology (4)
PHYS	151/L	General Physics (4)

Electives (8 hours)

BIOL	214/L	Microbiology* (4)
BIOL	216	General Botany* (3)
GEOL	410	Environmental Geology* (3)
GEOL	482	Geology of New Mexico* (2)
GEOL	484	Geology of Western National Parks (3)
PHYS	141/L	Astronomy (4)

Students wishing to pursue middle school licensure must take 12 of upper division courses (300/400-level). Other science courses with prior consent of advisor.

*Requires prerequisites or consent of instructor.