



ROWAN

Department of Chemistry and Physics
609/256-4855

OFFICE OF THE PROVOST

To: Pearl Bartelt
From: Robert Newland, Chairperson
Subject: Physics Degree
Date: March 11, 1997

MAR 12 1997

ROWAN COLLEGE OF NEW JERSEY

The Department has recognized that the creation of a BS in Physics Degree from a specialization track within the Physical Sciences Degree is an inappropriate means if we wish to retain the BS in Physical Sciences Degree as well. Since we do wish to retain this latter degree we wish to annul the request to change the Physical Sciences/Physics Degree into the BS Physics Degree. We will now follow the standard process for requesting the approval of a BS Physics Degree.

The students who have been lead to understand they were getting a BS in Physics Degree will be informed that their degree will be a BS in Physical Sciences degree with a specialization in physics.

RECEIVED
MAR 11 1997
OFFICE OF THE DEAN
ARTS AND SCIENCES

Approval Form

Proposal Title: Rename Degree from B.S. Physical Science to B.S. Physics

Sponsor(s) K. Mage-Sauer Dept.: Chemistry & Physics Ext. 3552

E. Flores, H. Ling

Check one: Course Specialization Concentration Minor Achievement Certificate
 Certification Program Major Program Minor Change? ?
(please name deletion or credit/title/catalog change)

Undergraduate Graduate _____ Credit Hours

<p>Step 1 (Department)</p> <p><input checked="" type="checkbox"/> Approved <u>10/14/94</u> Date</p> <p><input type="checkbox"/> Not Approved</p> <p><u>K. Mage-Sauer</u> Dept. CC Chairperson</p> <p><input checked="" type="checkbox"/> Reviewed <u>10/17/94</u> Date</p> <p><u>[Signature]</u> Dept. Chairperson</p>	<p>Step 2 (Receipt)</p> <p><input checked="" type="checkbox"/> SCC# <u>94-95-29</u></p> <p>Proposal Received _____ Date</p> <p><u>OCT 17 1994</u></p> <p><u>Ronald J. Gohler</u> SCC Chairperson</p>	<p>Step 3 (School CC)</p> <p>Reviewed <u>11/15/94</u></p> <p><input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not Approved</p> <p>Comments: _____</p> <p><u>Joanne Scott</u> School Curr Comm Chairperson</p>
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Step 4 (Academic Dean)

Recommend
 Not Recommend
 Conditionally Recommend (see comments)

Reviewed _____
Date

Comments:
[Handwritten Comments]

Signature, Dean of School

Step 5 (SCC)

Open Hearing 12/15/94 Approved by Senate Curriculum Committee 12/15/94
Date Date

Returned to sponsor(s) for the following reasons:

Step 6 (Senate)

Presented to Senate 12/15/94 Approved Not Approved
Date

Notification to Executive Vice President Provost 12/23/94
Date

[Signature]

Step 7 (Executive V.P./Provost)

Received 1/12/95
Date

Approved Yes No

If no, reasons are as follows

Student credit hours _____

Faculty load hours _____

Equalized credit hours _____

Official copy and approval sheet filed 1/12/95
Date

Donald L. Cephrad
Signature, Executive Vice-President/Provost

Registrar

Approved course description received 15/11/95
Date

Hegis Taxonomy and Course Number assigned N/A

B. J. Kelly
Signature, Registrar

15/11/95
Date

Notification forwarded:

- Senate Curriculum Committee Chairperson
- Department Chairperson(s)
- Academic Dean(s)
- Registrar
- Sponsor(s)

CHANGE OF DEGREE NAME

1. ABSTRACT

Change of Degree Name from “B.S. Physical Science/Physics” to “B.S. Physics”

Sponsor: K. Magee-Sauer, H. Ling, and E. Flores Department of Chemistry and Physics

In its "Review of Baccalaureate Physics Programs" the American Association of Physics Teachers discusses what the curriculum of a Physics degree program should be.

"The elementary level should included at least 5 subsections: Mechanics, Waves, Heat and Thermodynamics, Electricity and Magnetism, and Optics. In many departments a sixth subsection on Modern Physics assumes co-equal status Central to the physics major is the set of advanced undergraduate courses the student is required to take. There should be a rigorous, advanced treatment of topics in Mechanics, Electricity and Magnetism, Thermodynamics and Statistical Mechanics, Optics, Quantum Physics, and Experimental Physics. All may have only the elementary physics course as a prerequisite."

When comparing the above statement to our current degree in Physical Sciences, one must conclude that our degree is indeed a "Physics" degree and not a "Physical Sciences" degree.

2. Details

a. Title: Change of Degree Name from “B.S. Physical Science/Physics” to “B.S. Physics”

b. Sponsor: K. Magee-Sauer, H. Ling, and E. Flores

c. Size of Program: Physics courses are typically populated with Physical Science, Chemistry, Mathematics, Computer Science, Biology, and Pre-engineering majors (Pre-engineering will be phased out and the students replaced with Engineering majors), and non-matriculated students. Upper level courses are populated with Physical Science, Pre-engineering, and non-matriculated students. Post-Baccalaureate (Teaching) or MST students occasionally enroll in upper level Physics courses as well. At least two upper level Physics courses are offered each semester.

d. Relationship to Curriculum: The B.S. Physical Science/Physics is the current degree name for the Physics program. This degree title does not accurately reflect the content of

the degree. This is especially true since the phase out of the Geology and Earth Science program.

e. Pre-requisites: NA

f. Implementation time frame: The degree program already exists. The name change would be effective immediately.

g. Resources required: No additional resources are required. All courses are already being taught. With the new addition of a \$225,000 laser laboratory, a \$15,000 Scanning Tunneling Microscope, and 2 SGI workstations, our physics section's activity in research is increasing and further supports the name change.

3. Rationale:

The name of our degree program is historical in nature. At one time, there was one science department consisting of faculty from Biology, Chemistry, Earth Science, and Physics. These departments split into "Life Sciences" and "Physical Sciences."

Within the Physical Sciences Department, the Chemistry, Earth Science, and Physics Sections coexisted. The major was in "Physical Sciences" with an emphasis in Chemistry, Earth Science, or Physics.

In the 1990 Strategic Plan, the Earth Science degree was phased out with the elimination of tenure lines of those (retiring) faculty. The Earth Science courses required of the Physical Science degree were eliminated as well.

When the Earth Science section in our department was discontinued we changed our name from Department of Physical Sciences to the Department of Chemistry and Physics to accurately describe our curriculum. We propose to change the name of our degree to more accurately describe our Physical Sciences/Physics degree.

Without the contribution of Earth Science to the Physical Science/Physics degree, this degree no longer represents a "Physical Sciences" degree. By comparing the degree requirements to those of other schools (within the state and out of state), it is evident that the degree is a Physics degree and not a Physical Sciences degree. Our Physical Science/Physics program is a highly specialized program in physics that contains courses such as Modern Physics, Analytical Mechanics, Electrodynamics, Mathematical Physics, Quantum Mechanics, Optics, Electric Circuits, Statistical Mechanics, and Independent Research.

Potential physics students do not consider Rowan College as a place to study physics since currently we do not offer a "degree" in physics. The current degree name is misleading and it is adversely affecting our enrollment.

Please see attached Appendix for Physics degree requirements for: Trenton State College, Rutgers University, Montclair State College, James Madison University, and George Mason University.

4. Essence of Change of Degree name from Physical Science/Physics to Physics

a. Goals:

1. Accurately reflect the required curriculum of the degree
2. Update an “out of date” degree title (Physical Sciences/Physics).

b. Summary of Current Curriculum and Degree requirements:

General Education and College requirements (excluding Science and Math courses)

Free Electives

Required Collateral Courses:

Astronomy or Meteorology

Intro to Programming

Chemistry I and II

Calculus I, II, III

Required Physics Courses:

Physics I (with calculus)

Physics II (with calculus)

Physics III (Modern Physics)

Mechanics

Electricity and Magnetism

Optics and Light

Quantum Physics

Physics Elective (Choose from: Electric Circuits, Statistical Physics, Mathematical Physics, Independent Research)

c. Administration: The administration of the B.S. in Physics would be from within the Department of Chemistry and Physics.

5. Consultations:

R. Meagher, Biological Sciences; G. Itzkowitz, Mathematics; D. Stone, Computer Science; P. Bartelt, Dean SLAS; D. Kappel, Dean SERPS

PHYSICS AND GEOSCIENCE

SCHOOL OF MATHEMATICAL AND NATURAL SCIENCES

Chairperson: Richard Hodson

The Physics-Geoscience department consists of two separate areas of emphasis, each having its own expertise, majors, and programs within one administrative structure. The department offers separate major and minor programs in geoscience and in physics, plus teacher certification. Minors offered in either physics or geoscience are especially useful to students specializing in computer science or applied mathematics.

Part of the Physics-Geoscience department tradition is that a professor works with classes in the laboratory, not a graduate teaching assistant. This, plus a favorable student-faculty ratio, allows personal contact between student and professor. One is free to consult professors about course material for guidance or just to exchange ideas.

All programs are designed to provide substantial well-rounded preparation for students planning to enter graduate school, research, industry, or teaching.

Students entering this department should have an exposure to biology, chemistry and physics, plus three years of college preparatory mathematics. The physics major should have four years of college preparatory mathematics.

Geoscience Major

Required Courses

	Semester Hours
GEOS 112 Physical Geology	4
GEOS 114 Historical Geology	4
GEOS 431 Invertebrate Paleobiology	4
GEOS 434 Stratigraphy	4
GEOS 443 Mineralogy	4
GEOS 444 Petrology	4
GEOS 472 Structural Geology	3

Collateral Courses

CHEM 120, 121 General Chemistry I, II 4 ea.

Select two of the following in mathematics:

MATH 115 Precalculus Math 3

MATH 116 Calculus A 4

OR

MATH 122 Calculus I 4

MATH 221 Calculus II 4

Select one of the following sequences in physics:

PHYS 191, 192 General Physics I, II 4 ea.

PHYS 193, 194 College Physics I, II 4 ea.

Recommended in addition to the above:

CMPT 183 Foundation of Computer Science I 3

MATH 109 Statistics 3

Electives (Departmental)

The geoscience major is required to take 11 semester hours in geoscience major electives applying the following guidelines 11

Group I—One of the following courses:

PHYS 280 Astronomy 4

GEOS 360 Oceanography 3

GEOS 457 Meteorology 4

Group II—One of the following courses:

GEOS 250 Map Reading and Cartography 3

GEOS 310 Economic Geology 3

GEOS 410 Geology of New Jersey 3

Select additional courses from the appropriate list to be obtained from the department.

Geoscience Minor

Required Courses

	Semester Hours
GEOS 112 Physical Geology	4
GEOS 114 Historical Geology	4
Select one of the following two sequences:	
GEOS 431 Invertebrate Paleobiology	4
GEOS 434 Stratigraphy	4
OR	
GEOS 443 Mineralogy	4
GEOS 444 Petrology	4

Electives (Departmental)

Select 3 semester hours from the appropriate list to be obtained from the department 3

Physics Major

Required Courses

	Semester Hours
PHYS 191, 192 General Physics I, II	4 ea.
PHYS 210 Mechanics	4
PHYS 240 Electricity and Magnetism	4
PHYS 350 Optics	4
PHYS 460 Modern Physics	4

Collateral Courses

CHEM 120, 121 General Chemistry I, II 4 ea.

CMPT 183 Foundations of Computer Science I 3

MATH 122 Calculus I 4

MATH 221 Calculus II 4

MATH 222 Calculus III 4

MATH 420 Differential Equations 3

Electives (Departmental)

Select 14 semester hours from the appropriate list to be obtained from the department 14

Physics Minor

Required Courses

PHYS 191, 192 General Physics I, II	4 ea.
PHYS 240 Electricity and Magnetism	4
Plus either Option A or Option B:	

Option A

PHYS 210 Mechanics 4

PHYS Physics elective 3

Option B

Select two

PHYS 242 Circuit Theory 3

PHYS 245 Electronics and Digital Techniques 3

PHYS 247 Microprocessors and Their Applications 3

Total Semester Hours 18-19

the classes of En-
phy 391, 392, 421,
se requirements,
e departments.)
3L 400 Literature
31 Medieval Intel-
n Philosophy
n Philosophy
2 (346) Spense
n Philosophy

Psychology
PSYC 220 Personality/ Theory
PSYC 360 Theories and Systems of Psychology
PSYC 365 History of Psychology
PSYC 372 Physiological Psychology:
Neuropsychology
PSYC 506 Theories of Personality
PSYC/ENGL 581 Survey of Psycholinguistics

Sample Schedule for Philosophy Majors

First Semester	Second Semester
Natural science	4 Natural science
English composition	3 Literature
Foreign language	3 Foreign language
PHIL 100, 111, or 173	3 PHIL 151, 212, or 273
Social science	3 Communication
	16

Third Semester	Fourth Semester
Literature	3 English composition
Social science	3 Foreign language
Philosophy elective	3 Non-Western culture
Foreign language	3 PHIL 303 (232)
PHIL 301 (231)	3 Philosophy elective
	15

Fifth Semester	Sixth Semester
Social science	3 Social science
Non-Western culture	3 PHIL 336 or 337
PHIL 332	3 Philosophy electives
Philosophy elective	3 Nonphilosophy elective
ENGL 302	
	15

Seventh Semester	Eighth Semester
PHIL 421	3 PHIL 422 or 425
Fine arts	3 Electives
Electives	9
	15



Physics and Astronomy

Faculty

Professors: Blaisten-Barojas, Dworzeczka, Ehrlich, Ellsworth, Kalatos, Lankford, Lieb (Chair), Mielczarek, Trefil (Robinson Professor)
Associate Professors: Ceperley, Evans, Satija
Assistant Professor: Becker, Wallin
Visiting Assistant Professor: Kowalski
Instructor: Giebulowicz, John

Course Work

This department offers all course work designated ASTR and PHYS in the *Course Descriptions* section of this catalog.

B.S. Degree with a Major in Physics

In addition to general requirements for a B.S. degree, candidates must complete 45 semester hours in the major and 20 semester hours in mathematics, divided as follows:

1. A 33-hour core in physics, including PHYS 250, 303, 305, 306 or 307, 350, 351, 352, 353, 361, 402, 407, and 416 (may be taken for credit twice).

The remaining 12 credits must include at least five credits of physics and be elected from the following list below or approved in advance by the Physics Department: PHYS 306, 307, 328, 408, 417, 428, 510, 511, 512, 513, 530, 532, 535, 540, 542, 575; ECE 301, 333, 430, 431, 433, 442, 460; MATH 446 and 447; CHEM 331.

2. The following mathematics courses: the two-year calculus sequence — MATH 113, 114, 213 and 214; MATH 313 and MATH 314.

The requirements for the B.S. in physics prepare the student for graduate school or for one of the many careers in business or industry where physics graduates are employed. In meeting the requirement for 12 credit hours outside the core, a student has the option of electing an area of concentration. The courses required for each concentration are listed below. Students who wish to complete a concentration should plan a program of study in consultation with their adviser, with whom they are required to meet at least once a semester.

Graduate School Preparatory Concentration

Although any of the options listed here provide the successful student with a fully adequate background to enter graduate school, this concentration is for the student whose career goals definitely include graduate school in physics. To complete this concentration the student should take at least nine hours from the following courses: PHYS 510, 511, 512, 540 and ASTR 530. In addition, the student should complete a senior project (PHYS 408) in the specialty which they intend to pursue in graduate school.

Computational Physics Concentration

This concentration is for the student who wishes to pursue a career that applies computers to the solution of physical problems and data analysis. To complete this concentration, the student should take at least nine hours from the following courses: PHYS 510, ECE 442, MATH 446 and 447. In addition, the student should complete a senior project (PHYS 408) on a problem that involves the use of the computer for the solution of a physical problem.

Astrophysics Concentration

This concentration is for the student who is planning to attend graduate school in astrophysics or pursue a career in industry. To complete this concentration, the student should select four courses from the following: PHYS 428, ASTR 530, 532, 535, and MATH 446. In addition, the student should complete a senior project (PHYS 408) on an astrophysics problem.

Electronics Concentration

This concentration is for the student who wishes to pursue a career in industry applying a strong background in electronics to physical problems. To complete this concentration, the student should take at least nine credit hours from the following courses: ECE 301, 333, 430, 431, and 433. In addition, the student should complete a senior project (PHYS 408) on an electronics problem.

Applied Solid State Physics Concentration

This concentration is for the student who wishes to pursue a career in the semiconductor industry. To complete this concentration, the student should take the following courses: PHYS 512, ECE 430, and ECE 431. In addition, the student should complete a senior project (PHYS 408) in applied solid state physics.

B.A. Degree with a Major in Physics

In addition to the general requirements for a B.A. degree, candidates must complete 31 semester hours in the major and 17 semester hours of mathematics. The following physics courses are required: PHYS 250, 350, 351, 352, 353, 303, 305, 361, and 416.

Minor in Physics

A minor in physics requires 20 credits, including PHYS 250, 350, 351, 352, and 353 and any two courses from PHYS 303, 306, 307, 361, 401, 428 and 305 or 513.

Minor in Astronomy

A minor in astronomy requires the completion of a physics prerequisite and 15 credits in astronomy. The prerequisite consists of one of the two sequences: PHYS 343, 344, 345, 346 or PHYS 250, 350, 351, 352, 353. Following the introductory physics sequence, students are required to take ASTR 105, 106, PHYS 416, and two astronomy courses chosen from ASTR 228, 328, 428, and 530.

Psychology

PAGE Students

The general education requirements (with the exception of foreign language) for the B.A. degree are satisfied by successful completion of the Plan for Alternative General Education (PAGE). See PAGE category in this catalog, and see PAGE office for sample schedule for majors in physics.

Teacher Licensure (Certification)

Students who want to become elementary, middle, or secondary school teachers should consult the sections on licensure (certification) found in the catalog under the *Graduate School of Education*. Those planning to become secondary school teachers should consult with the secondary education adviser in their department.

Physics for Majors

Students who intend to major in physics should take the physics introductory sequence (PHYS 250, 350, 351, 352, 353). However, students who decide to major in physics after completing PHYS 343 and 345 may do so, but only with written permission of the Physics Department. Such students are required to take at least five additional credits in approved physics courses.

Physics for Nonmajors

PHYS 343, 344, 345, and 346 are recommended for biology, chemistry, geology, and premedical students and for mathematics majors who seek a bachelor of arts degree. PHYS 106 and 107 are also recommended for biology majors. PHYS 103, 104, 141, 201, 300, 315, and 316 are intended for nonscience majors. PHYS 250, 350, 351, 352, and 353 consist of a calculus-based sequence in general physics to be taken by physics and engineering majors and chemistry, computer science, and mathematics students who pursue a bachelor of science degree. Students may receive credit for only one of the following three sequences: 343, 344, 345, 346, or 103, 104, or 250, 350, 351, 352, and 353.

Sample Schedule for Physics Majors

First Semester	Second Semester	
MATH 113	PHYS 250	4
CHEM 211 or BIOL 113	MATH 114	4
ENGL 101	CHEM 212 or	4
Elective	BIOL 305 or 304	3
	Elective	3
		14

Third Semester

PHYS 350	3
PHYS 351	2
MATH 213	3
Literature	3
Electives	6
	17

Fifth Semester

PHYS 303	3
PHYS 305	3
PHYS/Math elective	3
MATH 313	3
ENGL 302	3
	15

Seventh Semester

PHYS 402	3
PHYS 407	3
PHYS 416	1
PHYS 510	3
Mathematics elective	3
Elective	3
	16

Psychology

Faculty

University Professor: Fleishman

Professors: Barocas, Boneau, Mandes (Associate Dean), Pasnak, R. Smith, Tyer (Associate Dean)

Associate Professors: Allen, Blaha, Boehm-Davis (Assistant Dean), Buffardi, Denham, Erdwins, Flinn (Chair), Friedman, Gerton, Gessner, Holt, Lehman, Maddux, Moretz, Mumford, Riskind, Rugel, Sanford, Tangney, Wahl, Zaccaro

Assistant Professors: Hershey, Short

Visiting Assistant Professors: Chrosniak, V. Smith, Wanshura

Adjunct Professors: Claiborn, Cobb, Hunt, Kurke, Weisman, Wyggs, Vekker

Lecturers: Chollar, Fochlinger, Feuerbach, Goodman, Jenkins, Kimberling, Manning, Mutchler, Shepanik, Smith-Marchese, Stanhope, Werber

Course Work

This department offers all course work designated PSYC in the catalog *Course Descriptions*.

B.A. Degree with a Major in Psychology

In addition to general requirements for a B.A. degree, students must complete 36 semester hours of course work in psychology, 24 of which must be at the 300-400 level. These hours must include PSYC 100, 211, 231, 300, 305, 325, 372, and 465.

B.S. Degree with a Major in Psychology

In addition to general requirements for a B.S. degree, candidates must complete the following:

- 38 semester hours of psychology (24 of which must be upper division), including PSYC 100, 211, 231, 300, 305, 325, 372, and 465; and one of the following: 304, 309, 323 or 372-373
- BIOL 103 and 104, plus 6 additional semester hours of natural science from astronomy, biology, chemistry, geology, physics, and GEOG 102 and 309.
- 6 semester hours of mathematics, selected from MATH 108, 110, 111, 113, 114 and 213
- CS 103
- 12 semester hours of social/behavioral science (other than psychology) and fine arts/religious studies/philosophy (other than PHIL 173 and 376). Courses must include a minimum of 6 hours in social/behavioral science and 3 in fine arts/religious studies/philosophy.
- ENGL 101, 302, and either ENGL 410 or a third laboratory course in psychology selected from PSYC 304, 309, 323, and 373.
- 6 semester hours of literature

Information for All Majors in Psychology

A grade of D in any of the eight (nine for B.S. students) required psychology courses may not be used toward graduation. At least 24 of the semester hours credited toward the major must be completed at the 300 level or above. Students intending to major in psychology should note that a grade of C or better in PSYC 300 is a prerequisite to required 300-level laboratory courses, and that a grade of C or better in PSYC 305 is a prerequisite to PSYC 465.

All psychology courses may be used to satisfy either the 36-hour psychology requirement for the B.A. degree or the 38-hour psychology requirement for the B.S. degree with the following restrictions:

- A maximum of 6 hours may be counted from PSYC 421, 422, 548, 549;
- A maximum of 6 hours may be counted from PSYC 260, 350, and 460;
- No more than 9 hours can be taken from 1 and 2 above without written permission of the department chair.
- PSYC 330 may not be taken for credit by psychology majors

In addition to course work, undergraduate research experience and letters of recommendation are major factors for admission to graduate school. Therefore, students interested in graduate school should distribute courses across a number of areas in psychology and work closely with one

or more professors on an individual basis during the junior and senior year. Students interested in developing skills in the application of psychology may wish to consider a psychology technician certificate or a gerontology certificate. These programs provide technical expertise for use in human employment settings at the paraprofessional level. Further information on these programs is found under *Certificates and Interdisciplinary Programs* in this catalog.

PAGE Students

The general education requirements and B.S. degrees (with the exception of language for the B.A.) are satisfied by completion of the Program for Alternative General Education (PAGE). However, the department recommends that PSYC 100 and BIOL 103 and 104 be taken in addition to the PAGE curriculum. See PAGE catalog, and see PAGE office for sample schedules for majors in psychology.

Psychology-Philosophy Double Major

For students who pursue a double major in psychology and philosophy, the Psychology Department accepts up to six hours of select philosophy courses toward psychology. Please see the Philosophy and Religion section of this catalog for details.

Sample Schedule for B.A. Psychology

First Semester	Second Semester	
ENGL 101	Non-Western literature	3
PSYC 100	PSYC 211, 23	3
Natural science	Natural science	4
Elective	Philosophy or religious studies	3
		13

Third Semester	Fourth Semester	
Literature	Literature	3
Math (110 suggested)	PSYC 300	3
PSYC 325	Foreign language	3
Foreign language	PSYC 372	3
Fine arts	Non-Western literature	3
		15

Fifth Semester

ENGL 302	3
Foreign language	3
Oral communication	3
Foreign language	3
PSYC 305	4
Elective	3
	16

Sixth Semester

Foreign language	3
PSYC 300/400	3
ECON/GOVT	3
Elective (300)	4
	13

PHYS 104

Individual Sports in Physical Education (1:3:0). Formerly *PHED 106, 302, 380, 381, 384, 385, 386*. For physical education majors to improve their skills and knowledge through in-depth study of basic I progressions and drills for teaching tennis, golf, other individual sport activities. Includes skill anal- and peer group teaching. *1.5*

Team Sports in Physical Education (3:0:3). For- by *PHED 382, 383, 387, 388, and 389*. For physical education major to improve their skills and knowl- edge through in-depth study of basic skill progressions and drills for teaching basketball, soccer, and other team activities. Includes skill analysis and peer group teaching. *1.5*

Curricular Experiences in School Physical Ed- ucation (3:3:0). *Prerequisite: PHED 303*. Curricular ex- periences and methods for K-12 physical education. Units 12 to 15 hours of field experience. *1.5*

Social/Psychological Aspects of Health and Fitness (3:3:0). Research, trends, and techniques in study of health and fitness. *1*

Student Teaching in Physical Education (0:0:0). *Prerequisite: Completion of all courses in the ap- plied program; acceptance in student teaching*. Super- vised clinical experience of a full semester in approved gina schools. Required experiences in elementary (six weeks) and secondary (seven weeks) school set- ings. Includes participation of one week in school pre- tice workshops and related activities (fall) or one k special simulated workshop (spring), and weekly inar sessions. *1.5*

Practicum in Athletic Training (1-3:0:0). *Pre-req- uire: PHED 330 and permission of instructor*. Applica- tion of techniques and procedures in the care and vention of athletic injuries in a selected environment led certified trainer supervision. Involves at least 100 rs of participation for each credit hour in athletic nning. *1.5*

Practicum in Physical Education (1-3:0:0). *Pre- requisite: 90 hours or 60 hours and permission of instruc- tor*. Supervised professional practice in a selected area nterest. Student may repeat this course but no more n 3 hours credit may be given. Each credit hour re- res a minimum of 60 hours of participation in the ctivity over a period of six weeks. Areas selected with r adviser approval. *1.5*

PHYS 104. For nonscience majors. Topics include me- chanics, relativity, cosmology, atomic physics, electricity and magnetism, nuclear physics, and elementary particles. Emphasis on historical, philosophical, and so- cial aspects of modern physics.

106, 107 Physics for the Life Sciences (3:3:0) (3:3:0). *Prerequisite: One year of college mathematics; PHYS 106 is prerequisite to 107*. Topics include mecha- nics, properties of fluids and gases, sound, heat, electric- ity, light, the atom, the nucleus, and radiation. Basic principles of physics emphasizing applications to biolog- ical sciences.

141 Elementary Physics (3:3:0). One-semester course for nonscience majors covering the basic con- cepts of classical and modern physics. PHYS 142 is an optional one-credit lab for this course.

142 Elementary Physics Lab (1:0:1). *Corequisite: PHYS 141*. Laboratory for PHYS 141.

201 Energy and Environment (3:3:0). Basic ideas of science and technology with emphasis on their interac- tion with our contemporary culture. Designed for sci- ence and nonscience majors with interests in current concerns of energy and environment. Origin, forms, uses, and distribution of energy and resulting environ- mental effects. *May not be included for credit by physics majors within the 45 hours of physics courses required for the B.S. degree or within the 31 hours of physics courses required for the B.A. degree.*

225 Problems in Physics I (1-3:0:0). *Prerequisite: 24 hours and 3.00 GPA in physics and mathematics*. Individ- ual study of physics problems of current interest. *May be taken 3 times.*

250 University Physics I (4:3:1). *Corequisite: MATH 114*. The first semester of three-semester calculus-based introductory physics sequence, designed primarily for science and engineering majors. Mechanics.

300/GOVT 300 Nuclear Weapons Technology and Politics (3:3:0). *Prerequisite: 60 hours or permission of instructor*. A study of the history and development of nuclear weapons and nuclear strategy, the physical basis of nuclear weapons and their biological and physical ef- fects, the effects of a nuclear war and the possible effec- tiveness of civil defense, the possibility of limited and winnable nuclear wars, arms control, nuclear prolifera- tion, and public opinion on nuclear issues. This course may not count toward the physics major requirement.

303 Classical Mechanics (3:3:0). *Prerequisite: PHYS 352, 353 and MATH 214*. Motion of a particle in one, two, and three dimensions; systems of particles; non-in- ertial coordinate systems; equations of Lagrange and Hamilton.

305/ECE 305 Electromagnetic Theory (3:3:0). *Pre- requisite: PHYS 352, 353 and MATH 214*. Interaction of sta- tic charges, interaction of stationary currents, electro- magnetic induction, Maxwell's equations.

306 Wave Motion and Electromagnetic Radiation (3:3:0). *Prerequisite: PHYS 305*. Vibrating string, plane waves, interference, diffraction, polarization, electro- magnetic waves, dispersion, and relativity.

307 Thermal Physics (3:3:0). *Prerequisite: PHYS 352, 303, or permission of instructor*. Classical concepts of en- ergy and temperature, basic definitions, first and second

laws of thermodynamics, properties of pure substances, equations of state, introduction to classical and quan- tum statistics and their application to physical systems.

311, 312 Mathematical Methods in Physics and En- gineering (3:3:0). (3:3:0). *Prerequisite: PHYS 352 and MATH 214 or 306; PHYS 311 or MATH 313 is prerequi- site for PHYS 312*. Math techniques as applied in phys- ics and engineering. Ordinary and partial differential equations, special functions, Fourier series, Laplace transforms, integral equations, matrices, and complex variables.

316 Sound and Light in the Arts (3:3:0). Nature of light, color and sound, mechanisms of vision and hear- ing, color addition, synthesis of musical sounds, com- puter-generated music and art; lasers; holography and fiber optics; recording and reproduction of sound and light. *May not be included for credit by physics majors within the 45 hours of physics courses required for the B.S. degree or within the 31 hours of physics courses re- quired for the B.A. degree. Frequent demonstrations.*

326 Problems in Physics II (1:0:0). *Prerequisite: 60 hours and 2.50 GPA in physics and mathematical science*. Individual study of physics problems of current interest. *May be taken three times.*

328/ASTR 328 Introduction to Astrophysics (3:3:0). *Prerequisite: PHYS 345 or 351 and MATH 113 or 115*. Physical concepts: Magnitudes of stars, Hertzsprung-Russell diagram, stellar radiation. Stellar structure and stellar evolution. White dwarfs, red giants, supernovae, neutron stars, black holes. Interstel- lar matter, dust, and molecules. Cosmic rays and mag- netic fields. Galactic structure, galaxies, quasars, and intergalactic matter. High-energy astrophysics, cosmol- ogy and general relativity. Models of the universe.

343, 345 College Physics (3:3:0). (3:3:0). (One hour recitation) *Prerequisite: 60 hours or one year of college-level science and one semester of college-level mathematics or permission of instructor*. *PHYS 343 is pre- requisite to 345*. Two-semester basic physics course with emphasis on topics of classical and modern physics of particular importance to science majors. The principles of mechanics, heat, electricity, magnetism, optics, atomic and nuclear physics.

344, 346 College Physics Lab (1:0:2). (1:0:2). *Corequisite: 343 (for 344) and 345 (for 346)*. Laboratory portion of two-semester basic physics course.

350 University Physics II (3:3:0). (One-hour recita- tion) *Prerequisite: PHYS 325; Corequisite: MATH 213; Waves, thermal physics, and electricity.*

351 University Physics II Laboratory (2:0:3). *Corequisite: MATH 213; PHYS 350*. Experiments in elec- tricity and mechanics.

352 University Physics III (3:3:0). (One hour recita- tion). *Prerequisite: PHYS 350; Corequisite MATH 214*. Electromagnetism, optics, and twentieth-century physics.

353 University Physics III Laboratory (2:0:3). *Corequisite: MATH 214 and PHYS 352*. Experiments in optics and modern physics.

361 Modern Physics with Applications (3:3:0). *Pre- requisite: MATH 214 and PHYS 352, and PHYS 303 or 305*. Study of modern physics with emphasis on applica- tions for scientists and engineers. Topics include mod-

ern optics, laser, binding and energy bands in solids, electrical, thermal and magnetic properties of solids, semiconductors, radioactivity, nuclear reactions, radi- ation detectors, and applications of nuclear physics to other sciences.

390 Topics in Physics (1-4:0:0). Selected topics in physics not covered in fixed content courses. *May not be included for credit by physics majors within the 45 hours of physics courses required for the B.S. degree or within the 31 hours of physics courses required for the B.A. degree.*

402 Introduction to Quantum Mechanics and Atomic Physics (3:3:0). *Prerequisite: PHYS 303 and 361, or permission of instructor*. Experimental basis of quantum mechanics; the wave function; systems in one, two, and three dimensions.

407 Senior Laboratory in Modern Physics (3:0:0). *Prerequisite: 21 credits of physics courses*. Experiments in modern physics involving advanced techniques in electronics, optics, nuclear physics, and solid state. Typi- cal experiments: the Frank Hertz Experiment, Hall Ef- fect, electron paramagnetic resonance, Mossbauer Effect.

408 Senior Research (2-3:0:0). *Prerequisite: 21 cred- its of physics courses*. The student works under the guid- ance of a faculty member on a research project in experimental or theoretical physics. *May be taken twice with permission of the Physics Department.*

416 Special Topics in Modern Physics (1:2:0). *Pre- requisite: 21 credits of physics courses*. Topics of major current interest in modern physics with emphasis on the breadth of physical understanding needed to approach many of today's problems.

417/GEOL 417 Geophysics (3:3:0). *Prerequisite: GEOL 101, 102, 201, 301; MATH 113, 114; and PHYS 250*. *Corequisite: MATH 213; PHYS 350, 351*. Seismo- logical and gravitational theory and application to an understanding of the earth's interior. The geology re- quirement may be waived for physics and engineering students with sufficient background.

428/ASTR 428 Relativity and Cosmology (3:3:0). *Prerequisite: PHYS 352, MATH 214 or 216, and PHYS 303, 305 or permission of instructor*. Special relativity, four-dimensional space-time, general relativity, non-Eu- clidian geometries, geodesic and field equations, tests of general theory of relativity, black holes, cosmology, models of the universe, remnant blackbody radiation, big bang cosmology, thermodynamics and the universe.

500 Physics for High School Teachers (3:3:0). *Pre- requisite: certification as a secondary school physics in- structor or permission of department*. Techniques of teaching high school physics. Introduction to modern physics with emphasis on concepts rather than mathe- matical formalism. Recent developments in physics.

501 Physics Laboratory Techniques for High School Teachers (3:3:0). *Prerequisite: Graduate stand- ing*. Theory and performance of experiments applicable to high school teaching with practical sessions on use of lab apparatus and computer. Recommended for high school teachers of physics.

502/PHYS 402 Introduction to Quantum Mechanics and Atomic Physics (3:3:0). *Prerequisite: PHYS 303 or permission of instructor*. Experimental basis of quan-

ysics (PHYS)

ysics and Astronomy

3, 104 Principles and Development of Modern Physics (4:3:3). (4:3:3). *PHYS 103 prerequisite to*

Program Requirements

The minimum requirement for the degree in physics is 36-38 credit hours of required physics courses. At least, 32 credit hours must be from physics courses numbered 250 and up.

Physics Courses

Choose one of the following:

PHYS 201-202. Discovering Physics I-II ¹ (six credits)	4-6
PHYS 240. Principles of Mechanics ¹ (four credits)	
PHYS 250. Principles of Electricity and Magnetism	4
PHYS 260. Principles of Waves, Continuous Media and Thermodynamics	3
PHYS 330. Modern Physics I	4
PHYS 335. Modern Physics II	4
PHYS 341. Mechanics	3
PHYS 347. Advanced Physics Laboratory I	2
PHYS 360. Analog Electronics	4
PHYS 380. Thermodynamics and Statistical Mechanics	3
PHYS 391-392. Seminar	1
PHYS 445. Electricity and Magnetism	3
PHYS 491-492. Physics Assessment and Seminar	1
	36-38

¹ PHYS 201-202 or PHYS 240 are prerequisite to PHYS 250.

The physics degree also requires 27 credit hours of courses taken in other departments.

Additional Requirements

CHEM 131-132. General Chemistry I-II	6
CHEM 131L-132L. General Chemistry Laboratory	2
Choose one of the following:	4
CS 238. Digital Computer Programming	
CS/MATH 248. Computer Methods in Engineering and Science	
MATH 235-236-237. Analytic Geometry and Calculus	12
MATH 336. Elementary Differential Equations	3
	27

Program Options

Students majoring in physics are encouraged to select one of the following two options in consultation with their faculty advisers. Students and their advisers should review progress toward completion of their selected option each semester.

Professional Physics

The professional physics option is intended for students who wish to prepare for graduate study in physics or a closely related field. Because excellent mathematical skills are very important to a successful career as a physicist, students in this option are encouraged to complete a minor in mathematics.

Choose two from the following:

PHYS 342. Mechanics II (three credits)	3
PHYS 430. Statistical Mechanics (three credits)	3
	6

- PHYS 440. Solid State Physics (three credits)
- PHYS 446. Electricity and Magnetism II
(three credits)
- PHYS 460. Quantum Mechanics (three credits)

Applied Physics Option

The applied physics option is recommended for students who plan to pursue careers in applied physics, engineering physics or related fields in applied science. This option is intended for students interested in post-baccalaureate employment in applied physics and is suitable preparation for graduate study in applied physics or engineering.

Choose from the following:

PHYS/CS 371. Introductory Digital Electronics (two credits)	2
PHYS/CS 372. Microcontrollers and Their Applications (two credits)	2
PHYS/CS 373. Interfacing Microcomputers (two credits)	2
PHYS 390. Computer Applications in Physics (three credits)	3
PHYS 440. Solid State Physics (three credits)	3
PHYS/CHEM 455. Lasers and Their Applications to Physical Sciences (three credits)	3
	9

Undergraduate Research

All physics majors in either option are encouraged to collaborate with faculty members on various research projects, usually in their junior and/or senior years. Academic credit for these activities will be given under PHYS 398, Problems in Physics and/or PHYS 498, Undergraduate Physics Research.

Typical Program for a Major in Physics¹ (B.S. Degree)

Freshman Year

CHEM 131-132. General Chemistry I-II	6
CHEM 131L-132L. General Chemistry Laboratory	2
ENG 101-102. Reading and Composition	6
MATH 235-236. Analytic Geometry and Calculus	8
PHYS 201-202. Discovering Physics I-II	6
Elective	0-3
	28-31

Sophomore Year

Choose from the following:	
CS 238. Digital Computer Programming	
CS/MATH 248. Computer Methods in Engineering and Science	
MATH 237. Analytic Geometry and Calculus III	4
MATH 336. Elementary Differential Equations	3
PHYS 250. Principles of Electricity and Magnetism	4
PHYS 260. Principles of Waves, Continuous Media and Thermodynamics	3
PHYS 330. Modern Physics I	4
Liberal studies courses	8
	30

Junior Year

PHYS 335. Modern Physics II	
PHYS 341. Mechanics	
PHYS 347. Advanced Physics Laboratory	
PHYS 360. Analog Electronics	
PHYS 391-392. Seminar	
PHYS 445. Electricity and Magnetism	
Liberal studies courses	
Elective	

Senior Year

PHYS 380. Thermodynamics and Mechanics	
Choose from the following:	
PHYS 398. Problems in Physics (one-three credits)	
PHYS 498. Undergraduate Physics (two-four credits)	
PHYS 499. Honors (six credits) ²	
PHYS 491-492. Physics Assessment	
Liberal studies courses	
Physics electives	
Electives	

¹ This program may be modified a student's advice in scheduling courses. Liberal studies requirements and outside the major.

² Participation in PHYS 499 must be in the physics department during the junior year. For further details, titled "Graduation with Distinction"

Initial Secondary Teaching License

In addition to the liberal studies major requirements, physics major teaching licensure must be completed as a part of their degree program.

EDUC 360. Foundations of America (junior year)	
EDUC 370. Instructional Technology	
EDUC 410. Multicultural Education	
EDUC 416. School Discipline and Management (senior year)	
HTH 370. The School Health Program (any appropriate time)	
PSYC 270. Psychology for Teachers: Pre-adolescent and Adolescent Children (sophomore year)	

J. M. [unclear]

Physics (three credits)
and Magnetism II

Mechanics (three credits)

Option

This option is recommended for students who wish to pursue careers in applied physics or related fields in industry. This option is intended for students who seek employment in industry. This is suitable preparation for graduate study in applied physics or engineering.

Credit Hours 9

Engineering: Factory Digital Electronics

Controllers and Their Applications (three credits)

Microcomputers

Applications in Physics

Physics (three credits)

Electronics and Their Applications (three credits)

Research

Both options are encouraged for faculty members on various levels. Participation in their junior and/or senior year for these activities will be rewarded. Problems in Physics and/or Graduate Physics Research.

Program

Minor in Physics¹

Chemistry I-II	6
General Chemistry Laboratory	2
Math and Composition	6
Geometry and Calculus	8
Engineering Physics I-II	6
	0-3
	28-31
Credit Hours	4
Computer Programming	
Engineering Methods in Engineering	
Geometry and Calculus III	4
Differential Equations	3
Electricity and Magnetism	4
Physics by Continuous Media	3
	4
	8
	30

Junior Year	Credit Hours
PHYS 335. Modern Physics II	4
PHYS 341. Mechanics	3
PHYS 347. Advanced Physics Laboratory I	2
PHYS 360. Analog Electronics	4
PHYS 391-392. Seminar	1
PHYS 445. Electricity and Magnetism	3
Liberal studies courses	9-12
Elective	3
	29-32
Senior Year	Credit Hours
PHYS 380. Thermodynamics and Statistical Mechanics	3
Choose from the following:	3-6
PHYS 398. Problems in Physics (one-three credits)	
PHYS 498. Undergraduate Physics Research (two-four credits)	
PHYS 499. Honors (six credits) ²	
PHYS 491-492. Physics Assessment and Seminar	1
Liberal studies courses	3-6
Physics electives	3-6
Electives	6-9
	28-31

¹ This program may be modified as needed in consultation with the student's adviser. There is considerable flexibility in scheduling courses taken to satisfy liberal studies requirements and elective courses outside the major.

² Participation in PHYS 499 must be approved by the physics department during the second semester of the junior year. For further details, see catalog section titled "Graduation with Distinction."

Initial Secondary Teaching License

In addition to the liberal studies and academic major requirements, physics majors desiring secondary teaching licensure must complete the following as a part of their degree program:

EDUC 360. Foundations of American Education (junior year)	3
EDUC 370. Instructional Technology (junior year)	3
EDUC 410. Multicultural Education (senior year)	1
EDUC 416. School Discipline and Classroom Management (senior year)	1
HTH 370. The School Health Program (any appropriate time)	2
PSYC 270. Psychology for Teachers of the Pre-adolescent and Adolescent Child ¹ (sophomore year)	3

READ 414. Reading and Writing in the Content Areas (senior year)	1
SEED 3711. Clinical Techniques, Natural Science Methods (normally in first semester of senior year)	3
SEED 381. Field Experience (Practicum) in Secondary Education (normally in first semester of senior year)	3
SEED 480. Student Teaching (senior year)	12
SPED 402. Teaching Mildly Disabled Students in Regular Classes (senior year)	1

¹ PSYC 160 is a prerequisite for PSYC 270.

A student desiring licensure in physics is also required to take courses in biology, chemistry and geology.

It is necessary to be admitted to the teacher education program prior to enrolling in professional education courses. See pages 111-113 in this catalog for admission procedures to the teacher education program.

Students seeking licensure are encouraged to consult regularly with the Department of Secondary Education, Library Science and Educational Leadership.

Minor in Physics

The minimum requirement for a minor in physics is 22 credit hours of physics courses selected as follows:

Specific Requirements	Credit Hours
Choose one of the following:	4-6
PHYS 201-202. Discovering Physics I-II (six credits)	
PHYS 240. Principles of Mechanics (four credits)	
PHYS 250. Principles of Electricity and Magnetism	4
PHYS 260. Principles of Waves, Continuous Media and Thermodynamics	3
Physics courses numbered above 260	9-11
	22

Students intending to minor in physics are encouraged to contact the head of the department, Miller Hall, Room 112.

Credit By Examination

The Department of Physics offers credit by examination for many of the courses taught in the department. Students who want permission to take an examination must apply to the department head during the regular registration period. Upon application, students will receive details regarding approval to take the examination and examination dates.

Physics Major (PHYA)

Freshman Year

HMRL 100/College Seminar	0
PHYS 201, 202/General Physics I & II	8
CMSC 215/Computer Science I	3
MATH 227, 228/Calculus I & II	6
RHET 101, 102/Rhetoric I & II	6
ISDC 101/Humanity: Ideas and Ideals	3
ISDC 201/Change in Societies General Education	3
Total for year	32

Sophomore Year

PHYS 321/Modern Physics	4
PHYS 406/Math Physics	3
ESCI 210/Electric Circuits	3
MATH 229/Calculus III	3
CHEM 201, 202/General Chemistry I & II	8
ISDC 252/Society, Ethics, and Technology Foreign Language* General Education	3
Total for year	33

Junior Year

MATH 326 or 386/Differential Equations	3
PHYS 301/Electromagnetic Fields	3
PHYS Physics Major required courses General Education	9-10
Foreign Language*	6
Physics Major option courses	3
Electives	3-6
Total for year	30-34

Senior Year

PHYS Physics Major required courses	11-12
General Education	6
Physics Major Option Courses	3
Electives	9-12
Total for year	29-33

Physics Major Required Courses (21 cr.)

PHYS 401/Mechanics	3
PHYS 411/Optics and Wave Motion	4
PHYS 412/Electromagnetic Theory	3
PHYS 416/Heat and Thermodynamics	3
PHYS 426/Particle and Nuclear Physics	3
PHYS 431/Introduction to Quantum Mechanics	3
PHYS 451/Advanced Physics Laboratory	2

Physics Major Option Courses (6 cr.)

CMSC 216/Computer Science II	3
ESCI 214/Electronic Circuit Design	3
ESME 395/Engineering Analysis	3
MATH 408/Linear Algebra	3
MATH 420/Complex Variables	3
PHYS 436/Solid State Physics	3
PHYS 466/Astrophysics	3
PHYS 499/Independent Study	variable

**Physics Major: (PHYC)
(Scientific Computer Programming Track)**

Freshman Year

HMRL 099/College Seminar	0
PHYS 201, 202/General Physics I & II	8
CMSC 215/Computer Science I	3
MATH 227, 228/Calculus I & II	6
RHET 101, 102/Rhetoric I & II	6
ISDC 101/Humanity: Ideas and Ideals	3

ISDC 201/Change in Societies	3
General Education	3
Total for year	32

Sophomore Year

PHYS 321/Modern Physics	4
PHYS 406/Math Physics	3
ESCI 210/Electric Circuits	3
MATH 229/Calculus III	3
CMSC 216/Computer Science II	3
ISDC 252/Society, Ethics, and Technology	3
CHEM 201, 202/General Chemistry I & II Foreign Language*	8
Total for year	33

Junior Year

MATH 326 or 386/Differential Equations	3
MATH 316/Introduction to Probability	3
CMSC 360/Unix and C	3
CMSC 305/Assembly Language Programming	3
PHYS 301/Electromagnetic Fields Physics Options Foreign Language*	4-7
General Education Requirements	3
Math and Computer Science Options	6
Total for year	31-34

Senior Year

Physics Options	7-10
General Education	12
Math and Computer Science Options	3
Electives	7
Total for year	29-32

* Students exempted from language requirements may take electives.

Physics Options

(14 cr. required)

ESCI 214/Electronic Circ.	3
PHYS 401/Mechanics	3
PHYS 411/Optics and Wave Motion	4
PHYS 412/Electromagnetic Theory	3
PHYS 416/Heat and Thermodynamics	3
PHYS 426/Particle and Nuclear Physics	3
PHYS 431/Introduction to Quantum Mechanics	3
PHYS 436/Solid State Physics	3
PHYS 451/Advanced Physics Laboratory	2
PHYS 499/Independent Study in Physics	variable

Math and Computer Science Options

(9 credits required with a minimum of 3 CMSC credits)

CMSC 320/Computer Logic and Design	3
CMSC 340/Programming in the Large	3
CMSC 410/Advanced Data Structures and Algorithms	3
MATH 220/Discrete Math I for Computer Applications	3
MATH 302/Introduction to Statistical Computation	3
MATH 408/Linear Algebra	3
MATH 425/Numerical Mathematics I	3
MATH 426/Numerical Mathematics II	3
MATH 435/Intro to Operations Research	3

Physics Major: Teacher Preparation (PHYT)

Candidates for a teacher education certificate must have a 2.5 cumulative grade point average, meet the state hygiene/physiology requirement, and pass the National Teacher Examination (NTE) before the New Jersey State Department of Education will issue the appropriate certificate. Teacher education candidates graduating after January 31, 1993, will receive a "Certificate of eligibility with

advanced standing" which requires a conditionally certified for his or her first year one year of successful teaching, the candidate must receive a permanent certificate. The teacher candidate must pay a fee during his or her first year.

Because of ongoing changes in general education teacher preparation requirements, on student's program of study is set out should consult with their department the remainder of their academic program should take into account requirements for general education, professional courses,

Freshman Year

HMRL 099/College Seminar	
PHYS 201, 202/General Physics I & II	
CMSC 215/Computer Science I	
MATH 227, 228/Calculus I & II	
RHET 101, 102/Rhetoric I & II	
ISDC 101/Humanity: Ideas and Ideals	
ISDC 201/Change in Societies General Education	
Total for year	

Physics Minor

PHYS 201, 202/General Physics I & II	
PHYS 301/Electromagnetic Fields	
PHYS 321/Modern Physics	
PHYS 406/Math Physics	
One advanced course with the prior approval of the Physics Department	
Total required	

NOTE: When course titles include I and II, the first is a prerequisite to the second half.

PHYS 101/Physics for the Health Sci

(3 class hours)
(annually-fall)
Emphasizes understanding important concepts of classical and modern physics given to understanding and appreciation of physics is to the health sciences based applications.

PHYS 121, 122/Physics for Non-science

(3 class hours, 2 lab hours)
(annually)
Not for science or mathematics major. Physical laws and concepts which apply to the physical environment. Stress on topics in PHYS 121: force, motion, gravitation. PHYS 122: wave motion, fields, magnetism, the atom, light, etc.

ASTR 161/Descriptive Astronomy

(3 class hours, 2 lab hours)
(every semester)
Study of celestial bodies. Topics: celestial sphere, moon, sun, planets, galaxies, cosmology, time, calendar with telescopes and planetarium demonstrations.

GOLG 120/Introduction to Geology

(3 class hours, 2 lab hours)
(every semester)
Perspectives on the World: Science. An introductory course in the principles of geology will include earthquakes, glacier sources, the evolution of the earth and