



University Bulletin

Undergraduate Degree Programs

Science, Eberly College

On March 17, 1989, Penn State's Board of Trustees renamed the College of Science to honor one of its most generous benefactors--the Eberly Family Charitable Trust of Uniontown. The generosity of the Eberly family has enabled the college to attract and retain outstanding faculty members who work at the cutting edge of their fields and who create opportunities for study and research that attract topflight graduate and undergraduate students.

The EBERLY COLLEGE OF SCIENCE provides instruction and research opportunities in the biological, mathematical, and physical sciences for students in this and other colleges in the University. The college offers ten majors that lead to the B.S. degree and two (Mathematics and Science) that lead to either the B.S. or B.A. degree. Various options are available within many of the majors. Many graduates continue their education in graduate or professional schools while others choose from a variety of careers in industry, government, or education.

UNDERGRADUATE INSTRUCTION -- In the first four semesters, basic biological and physical science, mathematics, and English are emphasized. Those who show an aptitude for scientific or mathematical work at the end of these four semesters continue in the major of their choice. To be eligible for entrance to a major in this college, a degree candidate must be enrolled in the college or satisfy requirements for entrance to the college. In addition, the degree candidate must meet entrance-to-major requirements of the University, of the college, and of the program area.

ENTRANCE-TO-COLLEGE REQUIREMENTS

In order to be eligible for entrance to the Eberly College of Science in premajor (SCIEN) status, a student must have:

- 1) Attained at least a 2.00 cumulative grade-point average
- 2) Completed MATH 140 with a grade of C or better

A student who meets the above requirements, but who has not demonstrated a comparable level of scholarship in other mathematics and science courses applicable to the programs of the college, is strongly encouraged to contact the Eberly College of Science Academic Advising Center or other appropriate advising personnel for assistance.

ENTRANCE-TO-MAJOR REQUIREMENTS

In order to be eligible for entrance to a major in the Eberly College of Science, a student must have:

1. Attained at least a 2.00 cumulative grade-point average
2. Completed MATH 140 with a grade of C or better
3. Satisfied all additional academic requirements as specified by the major:

<http://www.science.psu.edu/advising/majorrequirements/entrancetomajorrequirements.htm>(<http://www.science.psu.edu/advising/majorrequirements/entrancetomajorrequirements.htm>)

Note: For the Mathematics B.A. and the Science B.A. programs, see http://bulletins.psu.edu/bulletins/bluebook/ba_requirements.cfm(http://bulletins.psu.edu/bulletins/bluebook/ba_requirements.cfm) for courses that meet University-wide bachelor of arts degree requirements.

CONTINUING AND DISTANCE EDUCATION

Activities in Continuing and Distance Education include class and correspondence instruction in credit and noncredit courses and informal instruction.

CLASS INSTRUCTION--Instruction in the sciences is offered upon request, provided suitable facilities and faculty are available. Some courses carry college credit and are open only to qualified students; other courses are noncredit and are designed for adults interested in vocational or cultural self-improvement.

CORRESPONDENCE COURSE--College-credit courses in the physical, biological, and mathematical sciences are available through World Campus.

INFORMAL INSTRUCTION--These programs are designed to fit the needs of individuals and groups interested in some special phase of adult education, new developments in the field, or professional and industrial applications of new scientific discoveries. Tailored specifically to meet the needs and interests of the groups to be served, the programs are developed in conjunction with the groups themselves.

SCIENCE CAREER AND INTERNATIONAL EDUCATION

The Eberly College of Science Career and International Education office coordinates a number of domestic and international educational opportunities for science students.

First-year and sophomore students can participate in the Externship/Job Shadowing Program, which is not credit-bearing, but matches students with a science professional to introduce them to career fields of possible future interest.

Sophomore, junior, and senior students are able to gain major-related work experience while also earning academic credit (SC 295, 395, 495) through their participation in the Cooperative Education Program, or if they have identified a summer internship opportunity through their own personal networks, they can earn academic credit (SC 294, 494) for the experience pending departmental review and approval.

Students at all levels and in all majors will find a variety of academic study abroad opportunities, from faculty-led courses that include a short-term international experience to a full academic year of study at a science partner institution to earn the International Science Certificate. Early planning and careful coordination with academic advisers is strongly encouraged.

For more information about career and international education options for science students, please visit

<http://www.science.psu.edu/coop>(<http://www.science.psu.edu/coop>) and <http://www.science.psu.edu/scienceabroad>(<http://www.science.psu.edu/scienceabroad>)

EBERLY COLLEGE OF SCIENCE

DANIEL J. LARSON, *Dean*

NORMAN FREED, *Associate Dean*

KARIN E. FOLEY, *Associate Dean*

COLLEGE ORGANIZATION

Astronomy and Astrophysics -- LAWRENCE W. RAMSEY, *Head*

Biochemistry and Molecular Biology -- RICHARD FRISQUE, *Head*

Biology -- DOUGLAS CAVENER, *Head*

Chemistry -- AYUSMAN SEN, *Head*

Mathematics -- JOHN ROE, *Head*

Physics -- JAYANTH R. BANAVAR, *Head*

Statistics -- BRUCE LINDSAY, *Head*

Baccalaureate Degrees

Astronomy and Astrophysics

University Park, Eberly College of Science (ASTRO)

PROFESSOR LAWRENCE W. RAMSEY, *Head*

Astronomy involves the study of the properties, physical nature and origins of the planets, stars, galaxies and universe as a whole. It involves development of instrumentation, observations of celestial objects with ground- and space-based telescopes, and interpretation of findings using the mathematical laws of physics such as gravity, electromagnetism and quantum mechanics. The undergraduate major provides a strong and broad foundation in mathematics, physical science and computation as well as a detailed understanding of modern astronomy. Many research opportunities are available to complement the formal coursework. Graduates proceed to advanced degrees in astronomy and other sciences, and into a wide variety of technical professions.

In order to be eligible for entrance to the Astronomy and Astrophysics major, a student must have: 1) Attained at least a 2.00 cumulative grade-point average. 2) Completed ASTRO 291 GN(3), CHEM 110 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), and PHYS 212 GN(4); and earned a grade of C or better in each of these courses.

For the B.S. degree in Astronomy and Astrophysics, a minimum of 125 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of *Bulletin*.)

FIRST-YEAR SEMINAR:

(Included in REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 98 credits

(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 64 credits

PRESCRIBED COURSES (49 credits)

ASTRO 291 GN(3) [\[1\]](#)[#mnote01](#), ASTRO 292 GN(3) [\[1\]](#)[#mnote01](#), ASTRO 320 GN(2), ENGL 202C GWS(3), MATH 230(4), MATH 251(4), PHYS 237(3) (Sem: 3-4)
CHEM 110 GN(3) [\[1\]](#)[#mnote01](#), CHEM 111 GN(1), CHEM 112 GN(3), MATH 140 GQ(4) [\[1\]](#)[#mnote01](#), MATH 141 GQ(4) [\[1\]](#)[#mnote01](#), PHYS 211 GN(4) [\[1\]](#)[#mnote01](#), PHYS 212 GN(4) [\[1\]](#)[#mnote01](#), PHYS 213 GN(2) [\[1\]](#)[#mnote01](#), PHYS 214 GN(2) [\[1\]](#)[#mnote01](#). (Sem: 1-4)

ADDITIONAL COURSES (3 credits)

CMPSC 121 GQ(3), CMPSC 201 GQ(3), or CMPSC 202 GQ(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 12 credits [\[1\]](#)[#mnote01](#) from 400-level ASTRO courses except 496 (Sem: 5-8)

REQUIREMENTS FOR THE OPTION: 34 credits

GRADUATE STUDY OPTION: (34 credits)

PRESCRIBED COURSES (10 credits)

PHYS 400(3), PHYS 410(3-4), PHYS 419(3) (Sem: 5-8)

ADDITIONAL COURSES (9-10 credits)

Select 3 credits from MATH 405(3), MATH 411(3), or MATH 417(3) (Sem: 3-4)
 Select 6-7 credits from PHYS 401(3), PHYS 402(4), PHYS 406(3), PHYS 411(3), PHYS 420(3), PHYS 457(1-3), PHYS 457W(3), PHYS 461(3), and E E 471(3) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (14-15 credits)

Select 3 additional credits from advanced courses in computer science and engineering, mathematics, or statistics (Sem: 5-6)
 Select 11-12 credits in consultation with adviser from department list (Sem: 3-8)

COMPUTER SCIENCE OPTION: (34 credits)**PRESCRIBED COURSES** (9 credits)

CMPS 122(3), CMPS 221(3) (Sem: 5-6)
 CMPS 451(3) (Sem: 6-8)

ADDITIONAL COURSES (9 credits)

Select 3 credits from STAT 319(3), STAT 319(3), STAT 401(3), or STAT 414(3) (Sem: 5-6)
 Select 6 credits from CMPEN 271(3), CMPEN 331(3), CMPS 360(3), or CMPS 465(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16 credits)

Select 3 additional credits from advanced courses in computer science and engineering, mathematics, or statistics (Sem: 5-8)
 Select 13 credits in consultation with adviser from department list (Sem: 3-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-03-069

Review Date: 11/27/07

UCA Revision #1: 8/14/06

UCA Revision #2: 7/26/07

[Comments \(http://www.psu.edu/bulletins/bluebook/contact\)](http://www.psu.edu/bulletins/bluebook/contact)

SC

Biochemistry and Molecular Biology

University Park, Eberly College of Science (B M B)

PROFESSOR PHILIP W. MOHR, in charge

Students in this major apply basic principles of chemistry and physics to the study of living cells and their components to explain biology at molecular, genetic, and cellular levels. Students will develop a strong foundation in quantitative and analytical biological sciences, including molecular biology, biochemistry, enzymology, metabolism, cell biology, and molecular genetics. The Biochemistry Option is offered for students who have interests in the structures, properties and functions of macromolecules, and in the quantitative and analytical techniques used to characterize these macromolecules. The Molecular and Cell Biology Option is available to students whose interests relate to the growth, reproduction and differentiation of cells and to signaling processes that occur in multicellular systems that activate and modulate these processes. The curriculum is designed to prepare students for advanced study leading to careers in research, medicine, and education, or to secure employment in biotechnology and health-related industries, including government, academic, and private laboratories.

In order to be eligible for entrance to the Biochemistry and Molecular Biology major, a student must have: 1) attained at least a 2.00 cumulative grade-point average, and 2) completed CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), and MATH 140 GQ(4); and 3) earned a grade of C or better in each of these courses.

For the B.S. degree in Biochemistry and Molecular Biology, a minimum of 125 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
 (See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 95 credits [86]#mnote01

(This includes 15 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 55 credits**PRESCRIBED COURSES** (55 credits)

CHEM 110 GN(3) [11]#mnote01, CHEM 111 GN(1) [11]#mnote01, CHEM 112 GN(3) [11]#mnote01, CHEM 113 GN(1), MATH 140 GQ(4) [11]#mnote01, MATH 141 GQ(4), PSU 016(1) (Sem: 1-2)
 B M B 251(3) [85]#mnote01, B M B 252(3) [85]#mnote01, B M B 442(3), BIOL 322(3), CHEM 210(3), CHEM 212(3), CHEM 213(2), MICRB 201(3) [85]#mnote01, MICRB 202(2) (Sem: 3-4)
 B M B 400(2), B M B 401(3), B M B 402(3), B M B 443W(3) (Sem: 5-6)
 B M B 445W(2) (Sem: 7-8)

REQUIREMENTS FOR THE OPTION: 40 credits**BIOCHEMISTRY OPTION:** (40 credits)**PRESCRIBED COURSES:** (21 credits)

PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 2-4)
 CHEM 450(3), CHEM 452(3) (Sem: 5-8)
 B M B 474(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (19 credits)

Select 7-9 credits from any 400-level B M B/CHEM/MICRB course (Sem: 5-8)
 Select 2-3 credits in the mathematical sciences from department list B (Sem: 5-8)
 Select 7-10 credits from department list C (Sem: 5-8)

MOLECULAR AND CELL BIOLOGY OPTION: (40 credits)**PRESCRIBED COURSES:** (9 credits)

B M B 430(3), B M B 460(3) (Sem: 5-8)
 MICRB 410(3) (Sem: 5-8)

ADDITIONAL COURSES: (11-18 credits)

PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)
 CHEM 450(3), CHEM 452(3); or B M B 428(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS: (13-20 credits)

Select 5-6 credits from any 400-level B M B/MICRB course
 Select 2-3 credits in the mathematical sciences from department list B (Sem: 5-8)
 Select 4-13 credits from department list C (Sem: 5-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[85] To graduate, a grade of C or better is required in two of the following courses: MICRB 201, B M B/MICRB 251, B M B/MICRB 252.

[86] To graduate, a grade of C or better is required in 9 credits of any B M B or MICRB 400-level course except B M B 443W, B M B 444, B M B 445W, B M B 446, B M B 496, MICRB 421W, MICRB 422, MICRB 447, MICRB 496.

Last Revised by the Department: Fall Semester 2008

Blue Sheet Item #: 36-06-179

Review Date: 4/15/08

UCA Revision #1: 8/2/06

SC

Biology

Abington College (BIOAB)

Altoona College (BIOAL)

Berks College (BIOBL)

University Park, Eberly College of Science (BIOL)

Not all options are available at every campus. Contact the campus you are interested in attending to determine which options are offered.

PROFESSOR DOUGLAS CAVENER, Head

The curriculum in Biology is planned for preparation for professions requiring competence in biological science or for gaining an understanding of the world of living things. The professional group includes students who intend to secure advanced degrees through graduate study, students who are interested in work with various governmental agencies or industries having biological responsibilities, and students who want to prepare for careers in medicine or other health-related professions. Students whose interests are not professional select the curriculum because its broad approach can result in an educated view of the structure and function of living things. Achievement of these goals, including a special interest in a particular area of biology, can be met by selecting one of five options offered by the Department of Biology that will lead to the B.S. degree in Biology. The options and their key areas are 1) Plant Biology--morphology, systematics, and physiology of plants and fungi; 2) Ecology--behavior, and population and community biology of plants and animals; 3) General Biology--all aspects of modern biology; 4) Genetics and Developmental Biology--genetics, genetic engineering, and plant and animal development; 5) Neuroscience--development, biochemistry, physiology and aging of the central and peripheral nervous system; 6) Vertebrate Physiology--pre-medicine, pre-dentistry, pharmacology, and animal physiology.

In order to be eligible for entrance to the Biology major, a student must have: 1) attained at least a 2.00 cumulative grade point average; 2) completed BIOL 110 GN(4), CHEM 110 GN(3), MATH 140 GQ(4), and earned a grade of C or better in each of these courses; and 3) completed at least one of the following courses with a grade of C or better: BIOL 220W GN(4), BIOL 230W GN(4), or BIOL 240W GN(4).

TO VIEW THE [Biology Minor \(BIOL\) \(minors.cfm?letter=B&program=biolmin.htm\)](#)

For the B.S. degree in Biology, a minimum of 124 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
 (See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 94 credits

(This includes 15 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 40-44 credits**PRESCRIBED COURSES (32 credits)**

CHEM 110 GN(3) ~~111#mnote01~~, CHEM 111 GN(1), CHEM 112 GN(3) ~~111#mnote01~~, CHEM 113 GN(1), MATH 140 GQ(4) ~~111#mnote01~~, MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4) ~~111#mnote01~~, BIOL 220W GN(4) ~~111#mnote01~~, BIOL 230W GN(4) ~~111#mnote01~~, BIOL 240W GN(4) ~~111#mnote01~~ (Sem: 1-4)

ADDITIONAL COURSES (8-12 credits)

PHYS 250 GN(4), PHYS 251 GN(4); or PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 50-54 credits**ECOLOGY OPTION: (50-54 credits)****ADDITIONAL COURSES (30-33 credits)**

CHEM 202(3), CHEM 203(3), or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
Select 3-4 credits from STAT 200 GQ(4) or STAT 240 GQ(3) or STAT 250 GQ(3) (Sem: 3-4)
Select 3 credits from STAT 462(3) or STAT 464(3) (Sem: 7-8)

Select a minimum of 18 credits of 400-level biology courses, with at least 3 credits from each of the following groups (courses in Group IV--except BIOL 496, SC 295, SC 395, SC 495--may be used to satisfy requirements in other groups) (Sem: 5-8)

Group I: BIOL 412(3), BIOL 419(3), BIOL 435(3), BIOL 436(3), BIOL 444(3), BIOL 450W(3-5), BIOL 463(3), BIOL 482(3-4), BIOL 499A IL(3)

Group II: BIOL 414(3), BIOL 427(3), BIOL 428(3), BIOL 429(3), BIOL 448(3), BIOL 464(3), BIOL 474(3)

Group III: BIOL 406(3), BIOL 415(3), BIOL 417(4), BIOL 446(3), PPATH 425(4)

Group IV: BIOL 414(3), BIOL 417(4), BIOL 419(3), BIOL 444(3), BIOL 448(3), BIOL 450W(3-5), BIOL 482(3-4), BIOL 496(3), BIOL 499A IL(3), PPATH 425(4), SC 295(1-3), SC 395(1-3), SC 495(1-3) (A maximum of 3 credits of BIOL 496 or 4 credits of SC 295, SC 395, SC 495 may be used to fulfill the 18-credit minimum in the 400-level biology course requirement.)

SUPPORTING COURSES AND RELATED AREAS (17-24 credits)

Select 17-24 credits from department list (Sem: 1-8)

GENERAL BIOLOGY OPTION: (50-54 credits)**ADDITIONAL COURSES (24-27 credits)**

CHEM 202(3), CHEM 203(3), or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), or STAT 250 GQ(3) (Sem: 3-4)

Select a minimum of 18 credits of 400-level biology courses, with at least 3 credits from each of the following groups (each course may be used to satisfy a requirement in only one group) (Sem: 5-8)

Group I -- BIOL 407(3), BIOL 410(3), BIOL 414(3), BIOL 441(3), BIOL 443(3), BIOL 444(3), BIOL 446(3), BIOL 448(3), BIOL 499A IL(3), HORT 407(3), HORT 440W(3), PPATH 416(2-4), PPATH 425(4)

Group II -- BIOL 405(3), BIOL 411(3), BIOL 414(3), BIOL 417(4), BIOL 420(3), BIOL 421(4), BIOL 425(4), BIOL 427(3), BIOL 428(3), BIOL 438(3), BIOL 443(3), BIOL 460(3), BIOL 474(3)

Group III -- AN SC 442(3), B M B 400(2-3), B M B 450(2), BIOL 404(3), BIOL 405(3), BIOL 407(3), BIOL 410(3), BIOL 411(3), BIOL 416(3), BIOL 422(3), BIOL 426(3), BIOL 428(3), BIOL 430(3), BIOL 432(3), BIOL 439(3), BIOL 443(3), BIOL 448(3), BIOL 460(3), BIOL 499A IL(3), HORT 407(3)

Group IV -- BIOL 406(3), BIOL 412(3), BIOL 414(3), BIOL 415(3), BIOL 417(4), BIOL 419(3), BIOL 428(3), BIOL 429(3), BIOL 435(3), BIOL 436(3), BIOL 444(3), BIOL 446(3), BIOL 448(3), BIOL 450W(3-5), BIOL 463(3), BIOL 464(3), BIOL 474(3), BIOL 499A IL(3)

Group V -- BIOL 404(3), BIOL 406(3), BIOL 409(3), BIOL 411(3), BIOL 413(3), BIOL 416(3), BIOL 421(4), BIOL 426(3), BIOL 430(3), BIOL 432(3), BIOL 437(4), BIOL 443(3), BIOL 446(3), BIOL 460(3), BIOL 469(3), BIOL 470(3), BIOL 472(3), BIOL 479(3)

Group VI -- BIOL 400(1-3), BIOL 407(3), BIOL 414(3), BIOL 417(4), BIOL 419(3), BIOL 421(4), BIOL 437(4), BIOL 439(3), BIOL 444(3), BIOL 448(3), BIOL 450W(3-5), BIOL 461(3), BIOL 471(3), BIOL 473(2), BIOL 496(1-3), PPATH 425(4), SC 295(1-3), SC 395(1-3), SC 495(1-3)

SUPPORTING COURSES AND RELATED AREAS (23-30 credits)

Select 23-30 credits from department list (Sem: 1-8)

GENETICS AND DEVELOPMENTAL BIOLOGY OPTION: (50-54 credits)**PRESCRIBED COURSES (19 credits)**

CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
BIOL 322(3), BIOL 430(3) (Sem: 5-6)
B M B 401(2), B M B 402(3) (Sem: 5-8)

ADDITIONAL COURSES (17-21 credits)

Select 2-5 credits from MATH 220 GQ(2-3), MATH 231(2), MICRB 201(3), MICRB 202(2) (Sem: 3-6)
Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), STAT 250 GQ(3), or STAT 319(3) (Sem: 5-6)

Select a minimum of 12 credits of 400-level courses, with at least 6 credits from Group I, 3 credits from Group II, and 3 credits from Group III (Sem: 5-8)

Group I -- AN SC 442(3), B M B 400(2-3), B M B 450(2), BIOL 404(3), BIOL 405(3), BIOL 407(3), BIOL 410(3), BIOL 411(3), BIOL 413(3), BIOL 416(3), BIOL 422(3), BIOL 426(3), BIOL 427(3), BIOL 428(3), BIOL 432(3), BIOL 437(4), BIOL 439(3), BIOL 443(3), BIOL 448(3), BIOL 460(3), BIOL 469(3), HORT 407(3), MICRB 410(3)

Group II -- BIOL 405(3), BIOL 411(3), BIOL 414(3), BIOL 417(4), BIOL 420(3), BIOL 421(4), BIOL 425(4), BIOL 427(3), BIOL 428(3), BIOL 438(3), BIOL 443(3), BIOL 460(3), BIOL 474(3)

Group III -- BIOL 400(1-3), BIOL 407(3), BIOL 437(4), BIOL 439(3), BIOL 448(3), BIOL 461(3), BIOL 471(3), BIOL 473(2), BIOL 496(1-3), BIOL 499A IL(3), B M B 442(3), PPATH 425(4), SC 295(1-3), SC 395(1-3), SC 495(1-3)

SUPPORTING COURSES AND RELATED AREAS (10-18 credits)

Select 10-18 credits from department list (Sem: 1-8)

NEUROSCIENCE OPTION: (50-54 credits)**PRESCRIBED COURSES (19 credits)**

B M B 401(2), B M B 402(3) (Sem: 5-8)
BIOL 469(3), BIOL 470(3) (Sem: 5-8)
CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)

ADDITIONAL COURSES (15-16 credits)

Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), or STAT 250 GQ(3) (Sem: 3-4)

Select a minimum of 12 credits of 400-level biology courses, with at least 6 credits from Group I, 3 credits from Group II, and 3 credits from Group III (Sem: 5-8)

Group I -- B M B 400(2-3), BIOL 404(3), BIOL 409(3), BIOL 411(3), BIOL 413(3), BIOL 421(4), BIOL 426(3), BIOL 430(3), BIOL 437(4), BIOL 443(3), BIOL 460(3), BIOL 471(3), BIOL 472(3), BIOL 473(2), BIOL 479(3) (may select up to 6 credits from department list)

Group II -- BIOL 405(3), BIOL 411(3), BIOL 414(3), BIOL 417(4), BIOL 420(3), BIOL 421(4), BIOL 425(4), BIOL 427(3), BIOL 428(3), BIOL 438(3), BIOL 443(3), BIOL 460(3), BIOL 474(3)

Group III -- BIOL 400(1-3), BIOL 414(3), BIOL 417(4), BIOL 419(3), BIOL 421(4), BIOL 437(4), BIOL 439(3), BIOL 444(3), BIOL 448(3), BIOL 450W(3-5), BIOL 461(3), BIOL 471(3), BIOL 473(2), BIOL 496(1-3), BIOL 499A IL(3), SC 295(1-3), SC 395(1-3), SC 495(1-3)

SUPPORTING COURSES AND RELATED AREAS (15-20 credits)

Select 15-20 credits from department list (Sem: 1-8)

PLANT BIOLOGY OPTION: (50-54 credits)**PRESCRIBED COURSES (22 credits)**

CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
B M B 401(2), B M B 402(3), BIOL 407(3), BIOL 414(3), BIOL 441(3) (Sem: 5-8)

ADDITIONAL COURSES (12-13 credits)

Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), STAT 250 GQ(3), or an advanced statistics course (Sem: 3-4)

Select a minimum of 9 credits of 400-level biology courses, with at least 6 credits from Group I and 3 credits from Group II (Sem: 5-8)

Group I -- BIOL 410(3), BIOL 413(3), BIOL 427(3), BIOL 430(3), BIOL 443(3), BIOL 444(3), BIOL 446(3), BIOL 448(3), BIOL 499A IL(3), BIOTC 459(3), HORT 407(3), HORT 440W(3), PPATH 416(2-4), PPATH 425(4)

Group II -- BIOL 400(1-3), BIOL 414(3), BIOL 419(3), BIOL 439(3), BIOL 444(3), BIOL 448(3), BIOL 450W(3-5), BIOL 461(3), BIOL 496(1-3), BIOL 499A IL(3), SC 295(1-3), SC 395(1-3), SC 495(1-3)

SUPPORTING COURSES AND RELATED AREAS (15-20 credits)

Select 15-20 credits from department list (Sem: 1-8)

VERTEBRATE PHYSIOLOGY OPTION: (50-54 credits)**PRESCRIBED COURSES (18 credits)**

CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)
B M B 401(2), B M B 402(3), BIOL 472(3), BIOL 473(2) (Sem: 5-8)

ADDITIONAL COURSES (15-16 credits)

Select 3-4 credits from STAT 200 GQ(4), STAT 240 GQ(3), or STAT 250 GQ(3) (Sem: 5-8)

Select a minimum of 12 credits of 400-level courses, with at least 6 credits from Group I, 3 credits from Group II, and 3 credits from Group III (Sem: 5-8)

Group I -- BIOL 404(3), BIOL 406(3), BIOL 409(3), BIOL 411(3), BIOL 412(3), BIOL 413(3), BIOL 416(3), BIOL 421(4), BIOL 426(3), BIOL 430(3), BIOL 432(3), BIOL 437(4), BIOL 443(3), BIOL 446(3), BIOL 460(3), BIOL 469(3), BIOL 470(3), BIOL 471(3), BIOL 479(3) (may select up to 6 credits from department list)

Group II -- BIOL 405(3), BIOL 411(3), BIOL 414(3), BIOL 417(4), BIOL 420(3), BIOL 421(4), BIOL 425(4), BIOL 427(3), BIOL 428(3), BIOL 438(3), BIOL 443(3), BIOL 460(3), BIOL 474(3)

Group III -- BIOL 400(1-3), BIOL 414(3), BIOL 417(4), BIOL 419(3), BIOL 421(4), BIOL 437(4), BIOL 439(3), BIOL 444(3), BIOL 448(3), BIOL 450W(3-5), BIOL 461(3), BIOL 471(3), BIOL 473(2), BIOL 496(2), BIOL 499A IL(3), SC 295(1-3), SC 395(1-3), SC 495(1-3)

SUPPORTING COURSES AND RELATED AREAS (16-21 credits)

Select 16-21 credits from department list (Sem: 1-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-06-520
Review Date: 4/10/07
UCA Revision #1: 8/2/06
UCA Revision #2: 7/26/07
SC

Biotechnology

University Park, Eberly College of Science (BIOTC)

PROFESSOR PHILIP W. MOHR, in charge

Biotechnology may be broadly defined as the application of principles of molecular and cell science in the production of biologically important or industrially useful products. Therefore, students in the Biotechnology major will (1) acquire a strong foundation in the life and chemical sciences, (2) learn how fundamental science is applied to problems through biotechnology, (3) develop basic laboratory skills, perform standard techniques, work with state-of-the-art instrumentation, describe and evaluate analytical methodology used in biotechnology, and (4) become familiar with societal concerns and governmental regulations regarding the biotechnology industry. One very important strength of this major is the extensive laboratory experience each student receives. In the General option, students are very strongly encouraged to consider Cooperative Education with industry as an integral part of their curriculum. In addition to the General option in Biotechnology, the major also offers the Clinical Laboratory Science option.

In order to be eligible for entrance to the Biotechnology major, a student must have: (1) attained at least a 2.00 cumulative grade-point average, and (2) completed CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), and MATH 140 GQ(4) and earned a grade of C or better in each of these courses.

For the B.S. degree in Biotechnology, a minimum of 125 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 95 credits [87]#mnote04
(This includes 15 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 42 credits

PRESCRIBED COURSES (42 credits)
CHEM 110 GN(3) [1]#mnote04, CHEM 111 GN(1) [1]#mnote04, CHEM 112 GN(3) [1]#mnote04, CHEM 113 GN(1), MATH 140 GQ(4) [1]#mnote04, MATH 141 GQ(4), PSU 016(1) (Sem: 1-2)
PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 1-4)
B M B 251(3) [85]#mnote04, B M B 252(3) [85]#mnote04, BIOL 322(3), MICRB 201(3) [85]#mnote04, MICRB 202(2) (Sem: 3-4)
MICRB 421W(3) (Sem: 5-6)

REQUIREMENTS FOR THE OPTION: 53 credits

GENERAL BIOTECHNOLOGY OPTION: (53 credits)

PRESCRIBED COURSES (25 credits)
B M B 211(3), B M B 221(2), B M B 442(3), MICRB 410(3) (Sem: 5-6)
BIOTC 416(2), BIOTC 459(3), BIOTC 479(3), BIOTC 489(3), STAT 250 GQ(3) (Sem: 5-8)

ADDITIONAL COURSES (6-8 credits)
CHEM 202(3), CHEM 203(3); or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (20-22 credits)
Select 14-16 credits from department list (Sem: 3-8)
Select 6 credits from any 400-level B M B/MICRB lecture course, BIOL 422(3) or FD SC 408(2) (Sem: 5-8)

CLINICAL LABORATORY SCIENCE OPTION: (53 credits)
This option provides both the academic and clinical preparation for students interested in a career as a clinical laboratory scientist. Positions are found in hospital, physician-office, reference, industrial, and research laboratories. To complete baccalaureate degree requirements, students enter a twelve-month clinical practicum (MICRB 405A-F) at an affiliate hospital for the senior year. (Current affiliation is with Pennsylvania Hospital, Philadelphia.) Students are recommended for a fixed number of hospital positions on a competitive basis. Cumulative grade-point average and hospital school admission requirements serve as criteria for recommendation.

PRESCRIBED COURSES (44 credits)
B M B 211(3), B M B 212(1), B M B 221(2), MICRB 410(3), MICRB 412(3), MICRB 422(2) (Sem: 5-6)
MICRB 405A(8), MICRB 405B(1), MICRB 405C(6), MICRB 405D(5), MICRB 405E(7), MICRB 405F(3) (Sem: 7-8)

ADDITIONAL COURSES (6-8 credits)
CHEM 202(3), CHEM 203(3); or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (1-3 credits)
Select 1-3 credits from department list (Sem: 3-8)

Integrated B.S. in Biotechnology - Master of Biotechnology in Biotechnology

The integrated B.S. in Biotechnology-Master of Biotechnology degree program is designed to enable qualified undergraduate students in the B.S. Biotechnology program to graduate in five years with the Master of Biotechnology degree. The requirements of the Master of Biotechnology degree are designed to prepare students for diverse career opportunities in the burgeoning biotechnology industry. The integrated B.S. Biotechnology-Master of Biotechnology program will enhance the preparation and qualifications of B.S. Biotechnology students seeking entry-level positions in biotechnology and related industries. At the same time, students develop a practical knowledge of the laboratory techniques that underlie current research in the life sciences that will serve as excellent preparation for those students in the Master of Biotechnology program who later decide to pursue further graduate degrees.

A maximum of 12 credits will be cross-counted towards the B.S. and Masters degrees, from the following courses:
B M B 400(2-3), BIOTC 479(3), IBIOS 571(2), IBIOS 591(1), and IBIOS 593(3).

B.S. Biotechnology Requirements:
Total credits required: 125
GENERAL EDUCATION: 46 credits (15 of these are included in the REQUIREMENTS FOR THE MAJOR)
REQUIREMENTS FOR THE MAJOR: 94-95 credits

Prescribed courses: 67 credits
Additional courses: 6-9 credits
Supporting courses and related areas: 18-21 credits

Master of Biotechnology Requirements:
Total credits required: 30 (18 of which must be from 500-level courses)

Required courses: 16-19 credits
Electives: 11-14 credits

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[85] To graduate with a B.S. degree in Biotechnology, a grade of C or better is required in two of the following courses: MICRB 201, B M B/MICRB 251, B M B/MICRB 252.

[87] To graduate with a B.S. degree in Biotechnology, a grade of C or better is required in 9 credits of any BIOTC, B M B, or MICRB 400-level course except B M B 443W, B M B 444, B M B 445W, B M B 446, B M B 496, MICRB 421W, MICRB 422, MICRB 447, MICRB 496.

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-06-180

Review Date: 4/15/08

UCA Revision #1: 8/3/06

SC

Chemistry

University Park, Eberly College of Science (CHEM)

PROFESSOR Mark Maroncelli, Assistant Head for Undergraduate Education

This major provides a strong foundation in the theory and practice of chemistry. Mathematics and physics are emphasized, since these subjects are essential to the understanding of chemistry. Courses in English and electives ensure study in non-technical subjects which broaden the student's general education and enables him or her to relate the major to other fields of knowledge.

In order to be eligible for entrance to the Chemistry major, a student must have: 1) Attained at least a 2.00 cumulative grade-point average. 2) Completed CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), CHEM 210(3), MATH 140 GQ(4), and MATH 141 GQ(4); earned a grade of C or better in each of these courses; and earned a combined grade point average of at least 2.50 in these courses. (Note: If courses are repeated, only the better grade will be used in this calculation.)

For the B.S. degree in Chemistry, a minimum of 125 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 1 credit

REQUIREMENTS FOR THE MAJOR: 94 credits

(This requirement includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (55 credits)

CHEM 110 GN(3) [\[1\]#mnote04](#), CHEM 111 GN(1) [\[1\]#mnote04](#), CHEM 112 GN(3) [\[1\]#mnote04](#), CHEM 113 GN(1) [\[1\]#mnote04](#), MATH 140 GQ(4) [\[1\]#mnote04](#), MATH 141 GQ(4) [\[1\]#mnote04](#), (Sem: 1-2)
PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 1-4)
CHEM 210(3) [\[1\]#mnote04](#), CHEM 212(3) [\[1\]#mnote04](#), CHEM 213(2) [\[1\]#mnote04](#), CHEM 316(1), CHEM 431W(3) [\[1\]#mnote04](#), CHEM 450(3) [\[1\]#mnote04](#), CHEM 452(3) [\[1\]#mnote04](#), CHEM 457(2),
MATH 231(2) [\[1\]#mnote04](#), MATH 250(3) (Sem: 3-4)
PHYS 213 GN(2) and PHYS 214 GN(2) (Sem: 3-6)
MATH 220 GQ(2) (Sem: 5-6)

ADDITIONAL COURSES (21 credits)

CHEM 423(3) [\[1\]#mnote04](#) or CHEM 425(3) [\[1\]#mnote04](#), (Sem: 5-8)
Select 18 credits of chemistry at the 400 level. Up to 6 co-op credits (2 each of SC 295, SC 395, SC 495) may be used in this category. CHEM 494(1-10) may be used, but the total of CHEM 494 credits plus co-op credits may not exceed 8. (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (18 credits)

These 18 credits may include any courses not on the Department list of courses that do not count towards graduation. Only one credit of each of SC 295, SC 395, and SC 495 is allowed in this category. Chemical Research (CHEM 494 or CHEM 496) does not count in this category. (Sem: 3-6)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2009

Blue Sheet Item #: 37-05-051

Review Date: 2/24/09

UCA Revision #1: 8/3/06

SC

Forensic Science

University Park, The Eberly College of Science (FRNSC)

Forensic Science is the application of scientific principles and methods to assist criminal and civil investigations and litigation. This major is an inter-college collaboration among academic units and provides students with a strong foundation in the biological, physical, and mathematical sciences. It introduces them to relevant topics in criminalistics forensic chemistry, forensic anthropology, forensic biology, forensic entomology, and appropriate social sciences. Students are educated on the role of forensic scientists in the criminal justice system, the collection and analysis of scientific evidence, and the manner in which evidence is presented in court. Graduates of this major could pursue employment as a scientist in a federal, state, or private forensic laboratory or with insurance companies, homeland security agencies, or the judicial community. Graduates could also choose to pursue graduate study in forensics; specializing in forensic science, forensic medicine, or areas such as forensic psychology, anthropology, pathology, odontology, entomology, toxicology, or in the general sciences.

In order to be eligible for entrance to the Forensic Science major, a student must have: (1) attained at least a 2.00 cumulative grade point average (2) completed CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), MATH 140 GQ(4), MATH 141 GQ(4), and earned a grade of C or better in each of these courses.

For the B.S in Forensic Science a minimum of 124-126 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 Credits

(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin)

FIRST YEAR SEMINAR:

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES :

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 97-99 credits

(This includes 18 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GH courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 60 credits

PRESCRIBED COURSES: (52 credits) [\[1\]#mnote04](#)

CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), CHEM 210(3), CHEM 212(3), CHEM 213(2), MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)
CRIM 100 GS(3), CRIM 113 US(3) (Sem: 1-6)
PHIL 132 GH(3) (Sem: 1-8)
FRNSC 201W(4) (Sem: 4-5)
FRNSC 301(3), FRNSC 302(3) (Sem: 5-7)
FRNSC 400(1), FRNSC 401W(4) (Sem: 7-8)
STAT 250 GQ(3) (Sem: 5-8)
FRNSC 475(1) (Sem: 8)

ADDITIONAL COURSES: (8 credits) [\[1\]#mnote04](#)

PHYS 250 GN(4), PHYS 251 GN(4); or PHYS 211 GN(4), PHYS 212 GN(4) (Sem: 2-6)

REQUIREMENTS FOR THE OPTION: 37-39 credits

FORENSIC BIOLOGY OPTION: (39 credits)

PRESCRIBED COURSES: (24 credits) [\[1\]#mnote04](#)

B M B 251(3), MICRB 201(3), MICRB 202(2) (Sem: 1-4)
BIOL 222(3) (Sem: 3-5)
B M B 400(3) (Sem: 5-7)
B M B 401(3), B M B 442(3) (Sem: 5-7)
FRNSC 421W(4) (Sem: 7-8)

ADDITIONAL COURSES: (3 credits) [\[1\]#mnote04](#)

Select 3 credits from B M B 402(3), B M B 428(3), B M B 433(3), BIOL 405(3), BIOL 422(3), BIOL 460(3) (Sem: 6-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Up to 4 credits may be used to achieve the II level of foreign/second language (Spanish is recommended)

Select 12 credits; including at least 6 credits at the 400 level. (Sem: 3-8)

FORENSIC CHEMISTRY OPTION: (37 credits)

PRESCRIBED COURSES: (19 credits) [\[1\]#mnote04](#)

BIOL 110 GN(4), BIOL 230W GN(4) (Sem: 1-4)
CHEM 227(4), CHEM 425(3) (Sem: 3-5)
FRNSC 427W(4) (Sem: 6-8)

ADDITIONAL COURSES: (6 credits) [\[1\]#mnote04](#)

B M B 428(3), CHEM 402(3), CHEM 410(3), CHEM 412(3), CHEM 423(3), CHEM 430(3), CHEM 431W(3), CHEM 450(3), CHEM 452(3) or 3 credits of 400-level biochemistry (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Up to 4 credits may be used to achieve the II level of foreign/second language (Spanish is recommended)

Select 12 credits; including at least 6 credits at the 300-400 level (Sem: 3-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Fall Semester 2009

Blue Sheet Item #: 37-07-028

Review Date: 6/16/09

UCA Revision #1: 8/4/06

UCA Revision #2: 7/27/07

SC

Mathematics

Altoona College (MTAAL)

University Park, Eberly College of Science (MTHBA)

PROFESSOR JOHN ROE, Chair, Department of Mathematics

Two degrees are offered in mathematics: the Bachelor of Arts and the Bachelor of Science. Both programs have a common core of mathematics courses; both programs prepare students for graduate work in mathematics. In addition, the Bachelor of Arts degree is oriented toward applications of mathematics in the arts, humanities, and social sciences. The Bachelor of Science degree has a number of options. These options are oriented toward actuarial science, applied analysis, computational mathematics, graduate study, systems analysis, and teaching.

Many of the options are designed for students who want to use mathematics in industry, commerce, or government. In short, the degree requirements have the flexibility to fit many individual interests. The student, with the assistance of a faculty adviser, should select an option by the end of the sophomore year.

In order to be eligible for entrance to the Mathematics major, a student must have: 1) attained at least a 2.00 cumulative grade point average; and 2) completed MATH 140 GQ(4) and MATH 141 GQ(4) and earned a grade of C or better in each of these courses.

For the B.A. degree in Mathematics, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(6 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selections)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION or BACHELOR OF ARTS DEGREE REQUIREMENTS course selections)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credit

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits

(3 of these 24 credits are included in the REQUIREMENTS FOR THE MAJOR, GENERAL EDUCATION, or ELECTIVES and 0-12 credits are included in ELECTIVES if foreign language proficiency is demonstrated by examination.)

(See description of Bachelor of Arts Degree Requirements in this bulletin.)

REQUIREMENTS FOR THE MAJOR: 56 credits

(This includes 6 credits of General Education GQ courses.)

PRESCRIBED COURSES (23-25 credits)

MATH 140 GQ(4) [1]#mnote01, MATH 141 GQ(4) [1]#mnote01, MATH 220 GQ(2-3) [1]#mnote01, MATH 230(4) [1]#mnote01, MATH 311W(3-4) [1]#mnote01, MATH 312(3) [1]#mnote01 (Sem: 1-4)

MATH 403(3) [1]#mnote01 (Sem: 5-8)

ADDITIONAL COURSES (18-19 credits)

CMPS 101 GQ(3) or CMPS 121 GQ(3) or CMPS 201 GQ(3) (Sem: 1-2)

MATH 250(3) [1]#mnote01 or MATH 251(4) [1]#mnote01 (Sem: 3-4)

MATH 435(3) [1]#mnote01 or MATH 436(3) [1]#mnote01 (Sem: 5-8)

Select 3 credits [1]#mnote01 from MATH 411(3), MATH 412(3), MATH 417(3), MATH 419(3), or MATH 421(3) (Sem: 5-8)

Select 6 credits [1]#mnote01 of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (12-15 credits)

Select 13-15 credits from department list (Sem: 3-8)

Integrated B.A. in Mathematics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.A. in Mathematics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career oriented students to obtain training in statistics focused on developing data analysis skills, and exploration of core areas of applied statistics at the graduate levels in addition to an undergraduate degree in Mathematics. The M.A.S. degree is a professional masters degree that emphasizes applications. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts. Research divisions in the pharmaceutical industry, quality control, and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.A. in Mathematics and M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Mathematics B.A. program.
- Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415 and the students must apply to the integrated program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of Mathematics Department's undergraduate program committee. Two additional recommendation letters must be sent to the M.A.S. admissions committee.
- Must submit the GRE to the M.A.S. admissions committee.
- Must apply to the M.A.S. program in Statistics.

For the IUG B.A. in Mathematics and M.A.S. degree, 120 credits are required for the B.A. and 30 credits for the M.A.S. The following twelve graduate level credits (number of credits in parentheses) can apply to both B.A. and M.A.S. degrees, six of these are at the 500 level: STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3).

Assuming all requirements for the B.A. in Mathematics are completed, students in the program can complete the B.A. degree and not advance to the M.A.S. degree if they desire.

Degree Requirements

IUG Math B.A. students must fulfill the Math B.A. requirement while counting these prescribed Statistics courses (15 credits)
STAT 220(3)*, STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3)

IUG M.A.S. Requirements (30 credits)

STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3), STAT 580(2) and STAT 581(1)**

Electives: (15 credits)

Select from STAT 464(3), STAT 503(3), STAT 504(3), STAT 505(3), STAT 506(3), STAT 507(3), STAT 508(3), STAT 509(3), STAT 510(3) and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.

For the IUG B.A. in Mathematics and M.A.S. degree, the four courses: STAT 414(3), STAT 415(3), STAT 501(3) and STAT 502(3) can apply to both the B.A. and M.A.S. degrees.

*Can be waived for students with an equivalent course, e.g. STAT 250 GQ(3) or STAT 301 GQ(3).

** For all students in the M.A.S. program, the STAT 581(1) course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-05-088

Review Date: 2/26/08

UCA Revision #1: 8/18/06

UCA Revision #2: 7/30/07

SC

Mathematics

Altoona College (MTSAL)

University Park, Eberly College of Science (MTHBS)

Not all options are available at every campus. Contact the campus you are interested in attending to determine which options are offered.

PROFESSOR JOHN ROE, *Chair, Department of Mathematics*

Two degrees are offered in mathematics: the Bachelor of Arts and the Bachelor of Science. Both programs have a common core of mathematics courses: both programs prepare students for graduate work in mathematics. In addition, the Bachelor of Arts degree is oriented toward applications of mathematics in the arts, humanities, and social sciences. The Bachelor of Science degree has a number of options. These options are oriented toward actuarial science, applied analysis, computational mathematics, graduate study, systems analysis, and teaching.

Many of the options are designed for students who want to use mathematics in industry, commerce, or government. In short, the degree requirements have the flexibility to fit many individual interests. The student, with the assistance of a faculty adviser, should select an option by the end of the sophomore year.

In order to be eligible for entrance to the Mathematics major, a student must have: 1) attained at least a 2.00 cumulative grade point average; and 2) completed MATH 140 GQ(4) and MATH 141 GQ(4) and earned a grade of C or better in each of these courses.

For the B.S. degree in Mathematics, a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(6-12 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selections)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

ELECTIVES: 0-1 credit

REQUIREMENTS FOR THE MAJOR: 80-90 credits

(This includes 6-12 credits of General Education courses: 6 credits of GQ courses. In addition, the Teacher Certification option includes 6 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 26-28 credits

PRESCRIBED COURSES (20-21 credits)

MATH 140 GQ(4) [1]#mnote01 [53]#mnote53, MATH 141 GQ(4) [1]#mnote01 [53]#mnote53 (Sem: 1-4)

MATH 220 GQ(2) [1]#mnote01 [53]#mnote53, MATH 230(4) [1]#mnote01, MATH 311W(3-4) [1]#mnote01, MATH 312(3) [1]#mnote01 (Sem: 3-4)

ADDITIONAL COURSES (6-7 credits) [53]#mnote53

CMPS 101 GQ(3) [53]#mnote53 or CMPS 121 GQ(3) [53]#mnote53 or CMPS 201 GQ(3) [53]#mnote53 (Sem: 1-2)

MATH 250(3) [1]#mnote01 or MATH 251(4) [1]#mnote01 (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 52-62 credits

ACTUARIAL MATHEMATICS OPTION: (52-54 credits)

PRESCRIBED COURSES (33 credits)

IE 425(3), INS 301(3), INS 410(3), INS 411(3), INS 412(3), MATH 414(3) [1]#mnote01, MATH 415(3) [1]#mnote01, MATH 416(3) [1]#mnote01, MATH 451(3) [1]#mnote01, MATH 484(3) [1]#mnote01

STAT 460(3) (Sem: 5-8)

ADDITIONAL COURSES (3 credits) [1]#mnote01

Select 3 credits from 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (16-18 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select 8-10 credits from department list (Sem: 1-8)

APPLIED ANALYSIS OPTION: (52-54 credits)

PRESCRIBED COURSES (9 credits) [1]#mnote01

MATH 403(3), MATH 421(3), MATH 436(3) (Sem: 5-8)

ADDITIONAL COURSES (17 credits) [\[11/#mnote01\]](#)

MATH 414(3) or MATH 418(3) (Sem: 5-8)

Select 6 credits from MATH 411(3), MATH 412(3), or MATH 417(3) (Sem: 5-8)

Select one of the following sequences (8 credits): (Sem: 1-4)

- a. BIOL 110 GN(4), BIOL 220W GN(4)
- b. CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1)
- c. PHYS 211 GN(4), PHYS 212 GN(4)

SUPPORTING COURSES AND RELATED AREAS (26-28 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select an approved sequence of 12 credits in an area of application; possible areas include engineering and the physical, earth, or biological sciences (Sem: 1-8)

Select 6-8 credits from department list (Sem: 1-8)

COMPUTATIONAL MATHEMATICS OPTION: (52-54 credits)

PRESCRIBED COURSES (21 credits)

CMPS 122(3) (Sem: 3-4)

CMPS 465(3), MATH 414(3) [\[11/#mnote01\]](#), MATH 415(3) [\[11/#mnote01\]](#), MATH 455(3) [\[11/#mnote01\]](#), MATH 456(3) [\[11/#mnote01\]](#), MATH 484(3) [\[11/#mnote01\]](#), (Sem: 5-8)

ADDITIONAL COURSES (12 credits) [\[11/#mnote01\]](#)

MATH 467(3) or MATH 469(3) (Sem: 5-8)

Select 3 credits from MATH 411(3), MATH 412(3), or MATH 417(3) (Sem: 5-8)

Select 6 credits from CMPS 468(3), MATH 310(3), MATH 459(3), MATH 468(3), MATH 483(3), or MATH 485(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (19-21 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select 11-13 credits from department list (Sem: 1-8)

GENERAL MATHEMATICS OPTION: (52-54 credits)

PRESCRIBED COURSE (3 credits) [\[11/#mnote01\]](#)

MATH 403(3) (Sem: 5-8)

ADDITIONAL COURSES (15 credits) [\[11/#mnote01\]](#)

MATH 414(3) or MATH 418(3); MATH 435(3) or MATH 436(3) (Sem: 5-8)

Select 3 credits from MATH 411(3), MATH 412(3), MATH 417(3), or MATH 421(3) (Sem: 5-8)

Select 6 credits of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (34-36 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select an approved sequence of 12 credits in MATH or a related area or an area of application (Sem: 1-8)

Select 14-16 credits from department list (Sem: 1-8)

GRADUATE STUDY OPTION: (52-54 credits)

PRESCRIBED COURSES (18 credits) [\[11/#mnote01\]](#)

MATH 403(3), MATH 404(3), MATH 421(3), MATH 429(3), MATH 435(3), MATH 436(3) (Sem: 5-8)

ADDITIONAL COURSES (12 credits) [\[11/#mnote01\]](#)

MATH 414(3) or MATH 418(3) (Sem: 5-8)

Select 9 credits of 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (22-24 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select 14-16 credits from department list (Sem: 1-8)

SYSTEMS ANALYSIS OPTION: (52-54 credits)

PRESCRIBED COURSES (12 credits) [\[11/#mnote01\]](#)

MATH 414(3), MATH 415(3), MATH 436(3), MATH 484(3) (Sem: 5-8)

ADDITIONAL COURSES (9 credits) [\[11/#mnote01\]](#)

Select 6 credits from MATH 310(3), MATH 451(3), MATH 485(3), or MATH 486(3) (Sem: 5-8)

Select 3 credits from 400-level MATH courses except MATH 401(3), MATH 405(3), MATH 406(3), MATH 441(3), MATH 470(3), MATH 471(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (31-33 credits)

Select 8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from department list to total 8 credits) (Sem: 1-4)

Select an approved sequence of 12 credits in an area of application; possible areas include business, economics, industrial engineering, social sciences (Sem: 1-8)

Select 11-13 credits from department list (Sem: 1-8)

TEACHER CERTIFICATION OPTION: (62 credits) [\[54/#mnote54\]](#)

This option helps prepare individuals for mathematics education teaching positions in secondary schools. It includes the academic requirements for the Mathematics Education Instructional I certificate issued by the Pennsylvania Department of Education (see also Teacher Education Programs).

PRESCRIBED COURSES (53 credits)

EDPSY 014(3) [\[53/#mnote53\]](#), EDTHP 115 US(3) (Sem: 1-2)

HD FS 239 GS(3) [\[53/#mnote53\]](#), PSYCH 100 GS(3) (Sem: 1-2, 5-6)

C 1 295(2) [\[53/#mnote53\]](#), C 1 412W(3) [\[53/#mnote53\]](#), C 1 495C(3) [\[53/#mnote53\]](#), C 1 495E(15) [\[53/#mnote53\]](#), MATH 427(3) [\[11/#mnote01\]](#), MATH 435(3) [\[11/#mnote01\]](#), MATH 436(3) [\[11/#mnote01\]](#), MTHED 411(3) [\[53/#mnote53\]](#), MTHED 412W(3) [\[53/#mnote53\]](#), MTHED 427(3) [\[53/#mnote53\]](#), (Sem: 5-8)

ADDITIONAL COURSES (9 credits)

MATH 310 [\[11/#mnote01\]](#) or MATH 483(3) [\[11/#mnote01\]](#); MATH 414(3) [\[11/#mnote01\]](#) or MATH 418(3) [\[11/#mnote01\]](#), (Sem: 3-8)

Select 3 credits from 400-level EDTHP courses [\[53/#mnote53\]](#), (Sem: 3-8)

Integrated B.S. in Mathematics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.S. in Mathematics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career oriented students to obtain training in statistics focused on developing data analysis skills, and exploration of core areas of applied statistics at the graduate levels in addition to an undergraduate degree in Mathematics. The M.A.S. degree is a professional masters degree that emphasizes applications. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts. Research divisions in the pharmaceutical industry, quality control, and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.S. in Mathematics and M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

- Must be enrolled in the Mathematics B.S. program.
- Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415 and the students must apply to the integrated program prior to completing 110 credits.
- Must submit a transcript and a statement of purpose.
- Must present a departmental approved plan of study in the application process in consultation with the M.A.S. program director.
- Must be recommended by the chair of Mathematics Department's undergraduate program committee. Two additional recommendation letters must be sent to the M.A.S. admissions committee.
- Must submit the GRE to the M.A.S. admissions committee.
- Must apply to the M.A.S. program in Statistics.

For the IUG B.S. in Mathematics and M.A.S. degree, 120 credits are required for the B.S. and 30 credits for the M.A.S. The following twelve graduate level credits (number of credits in parentheses) can apply to both B.S. and M.A.S. degrees, six of these are at the 500 level: STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3).

Assuming all requirements for the B.S. in Mathematics are completed, students in the program can complete the B.S. degree and not advance to the M.A.S. degree if they desire.

Degree Requirements

IUG Math B.S. students must fulfill the Math B.S. requirement while counting these prescribed Statistics courses (15 credits)

STAT 220(3)*, STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3)

IUG M.A.S. Requirements (30 credits)

STAT 414(3), STAT 415(3), STAT 501(3), STAT 502(3), STAT 580(2) and STAT 581(1)**

Electives: (15 credits)

Select from STAT 464(3), STAT 503(3), STAT 504(3), STAT 505(3), STAT 506(3), STAT 507(3), STAT 508(3), STAT 509(3), STAT 510(3) and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.

For the IUG B.S. in Mathematics and M.A.S. degree, the four courses: STAT 414(3), STAT 415(3), STAT 501(3) and STAT 502(3) can apply to both the B.S. and M.A.S. degrees.

*Can be waived for students with an equivalent course, e.g. STAT 250 GQ(3) or STAT 301 GQ(3).

** For all students in the M.A.S. program, the STAT 581(1) course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[53] A grade of C or better per course is required for teacher certification.

[54] Mathematics majors who wish to teach in public schools must schedule the teacher certification requirements prescribed by the College of Education as shown on this page. In addition, they must file an application in the Certification and Education Services Office, 181 Chambers Building, prior to the end of the second semester. At that time, they will be assigned an adviser in the College of Education to help them schedule the appropriate professional course work.

[56] Offered only for Satisfactory/Unsatisfactory grading.

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-05-089

Review Date: 2/26/08

UCA Revision #1: 8/16/06

UCA Revision #2: 7/30/07

SC

Select 4 credits from PHYS 402(4) or PHYS 458(4) (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (15 credits)

Select 3 credits of natural science (GN) courses that are not listed in the major (Sem: 3-8)

Select 12 credits from program list; a maximum of 6 of the 12 credits may be from PHYS 496(1-18), SC 295(1-3), SC 395(1-3), or SC 495(1-3) (Sem: 3-8)

MEDICAL PHYSICS OPTION: (31-33 credits)

This option enables the graduate to meet all of the academic requirements for a minor in bioengineering. Application for a certificate indicating the minor must be made to the Department of Bioengineering.

PRESCRIBED COURSES (16 credits)

CHEM 202(3), CHEM 203(3) (Sem: 3-4)

PHYS 402(4) (Sem: 5-6)

BIOE 401(3), BIOE 402(3) (Sem: 7-8)

ADDITIONAL COURSES (12-14 credits)

BIOL 110 GN(4), BIOL 240W GN(4), BIOL 472(3); or B M B 251(3), B M B 252(3), BIOL 141 GN(3) (Sem: 3-6)

Select 3 credits from 400- or 500-level BIOE [\[57\]#mnote57](#) courses (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (3 credits)

Select 3 credits from program list (Sem: 5-8)

TEACHING OPTION: (51 credits)

This option enables the graduate to meet all of the academic requirements for the Instructional I certificate for teaching at the secondary school level, which is provided by the Commonwealth. Students interested in this option should read carefully the section on Teacher Education Programs in this *Bulletin*.

PRESCRIBED COURSES (48 credits) [\[53\]#mnote53](#)

EDPSY 014(3), EDTHP 115(3), PSYCH 100 GS(3), PSYCH 412(3), S T S 200 GS(3) (Sem: 3-6)

C I 295(2), C I 412W(3), C I 495C(3), C I 495E(15) (Sem: 5-8)

BIOL 011 GN(3), BIOL 012 GN(1), SCIED 411(3), SCIED 412(3) (Sem: 7-8)

ADDITIONAL COURSES (3 credits) [\[53\]#mnote53](#)

Select 3 credits from EDTHP 401(3), EDTHP 416(3), EDTHP 430(3), or EDTHP 440(3) (Sem: 7-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[53] A grade of C or better per course is required for teacher certification.

[55] The listed non-mathematical prerequisite for AERSP 308(3) is satisfied by PHYS 402(4), PHYS 419(3), and PHYS 443(3); for A E 458(3) by ACS 402(3) or PHYS 443(3); for E E 460(3) by PHYS 402(4), PHYS 419(3), and PHYS 443(3); for E MCH 412(3) by PHYS 419(3) and PHYS 443(3); for M E 471(3) by AERSP 308(3) and PHYS 420(3); for E E 311(3) by replacing E SC 314(3) with PHYS 412(3); for E E 320(3), E E 420(3), and E E 421(3) by replacing E E 330(4) with PHYS 400(3); for E E 432(3) and E E 438(3) by replacing E E 330(4) with PHYS 400(3); for E E 460(3) by PHYS 402(4), PHYS 419(3), and PHYS 443(3).

[57] Student must have seventh-semester status and a minimum GPA of 3.50.

Last Revised by the Department: Spring Semester 2005

Blue Sheet Item #: 33-01-391

Review Date: 9/19/06

UCA Revision #1: 8/31/06

UCA Revision #2: 7/30/07

SC

Premedical-Medical

University Park, Eberly College of Science (P M M)

PROFESSOR RONALD A. MARKLE, *in charge*

This is a special accelerated program in cooperation with the College of Medicine at Thomas Jefferson University in Philadelphia whereby exceptional students have the opportunity to earn both the B.S. and M.D. degrees in six years. Students are selected for this program while they are seniors in high school and must begin their undergraduate studies the summer immediately following their graduation. The first two years of the program are completed at University Park and the next four at Jefferson. The Penn State B.S. degree in Science is awarded after completion of 82 Penn State credits and the first two years of the standard curriculum at Jefferson Medical College.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:

(Included in GENERAL EDUCATION course selection)

ELECTIVES: 0-1 credit

REQUIREMENTS FOR THE MAJOR: 51-53 credits

(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (41 credits)

BIOL 110 GN(4) [\[1\]#mnote01](#), CHEM 110 GN(3) [\[1\]#mnote01](#), CHEM 111 GN(1) [\[1\]#mnote01](#), CHEM 112 GN(3) [\[1\]#mnote01](#), CHEM 113 GN(1) [\[1\]#mnote01](#), MATH 140 GQ(4) [\[1\]#mnote01](#), MATH 141

GQ(4) [\[1\]#mnote01](#) (Sem: 1-2)

CHEM 210(4), CHEM 212(3), CHEM 213(2), PHYS 201 GN(4), PHYS 202 GN(4), PHYS 204 GN(4) (Sem: 3-4)

ADDITIONAL COURSES (at Jefferson Medical)

Anatomy (Sem: 5-6)

Physiology (Sem: 5-6)

Histology (Sem: 5-6)

Biochemistry (Sem: 5-6)

Biostatistics (Sem: 5-6)

Neuroscience (Sem: 5-6)

Mechanisms of Disease (Sem: 5-6)

Introduction to Clinical Medicine (Sem: 5-8)

Medicine and Society (Sem: 5-8)

Microbiology/Immunology (Sem: 7-8)

Pathology (Sem: 7-8)

Pharmacology (Sem: 7-8)

SUPPORTING COURSES AND RELATED AREAS (10-12 credits)

Select 4-5 credits of life science with lab (Sem: 1-4)

Select 3 credits from program list (Sem: 1-4)

Select 3-4 credits of life science (Sem: 3-4)

Note: Students must take at least 9 of the Penn State credits listed above during the summer session prior to the first semester. Depending on advanced placement credit and schedule load, it might also be necessary to enroll during one of the other summer sessions before entering Jefferson Medical College at semester five.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 1995

Blue Sheet Item #: 23-03-107

Review Date: 01/19/00 (General Education information updated)

UCA Revision #1: 8/9/06

SC

Publications updated faculty in charge: 7/17/09

Premedicine

University Park, Eberly College of Science (P M)

PROFESSOR RONALD A. MARKLE, *in charge*

This major provides a broad foundation necessary to the understanding of the basic subjects of modern medical studies. The curriculum, which offers a good balance between science and nonscience courses, constitutes an excellent preparation for admission to medical school. It also gives students the freedom to tailor the program to meet their individual needs by permitting a generous number of supporting courses. Specific admission requirements or recommendations of a particular medical school, not already in the required courses of the major, may be included among the supporting courses. Many students also use their supporting courses to pursue a minor.

In order to be eligible for entrance to the Premedicine major, a student must have: 1) attained at least a 2.00 cumulative grade-point average; and 2) completed BIOL 110 GN(4), CHEM 110 GN(3), and MATH 140 GQ(4), and earned a grade of C or better in each of these courses.

THREE-YEAR ALTERNATIVE: A student may also become eligible for the Bachelor of Science degree in this major upon satisfactory completion of:

a. A total of 96 credits, including General Education credits in Writing/Speaking, Health Sciences and Physical Education, and Arts, Humanities, and Social and Behavioral Sciences: 8 credits in a single foreign language; BIOL 110 GN(4), BIOL 230W GN(4); CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), CHEM 210(3) [\[1\]#mnote01](#), CHEM 212(3) [\[1\]#mnote01](#), CHEM 213(2) [\[1\]#mnote01](#),

MATH 140 GQ(4), MATH 141 GQ(4); PHYS 211 GN(4) [\[1\]#mnote01](#), PHYS 212 GN(4) [\[1\]#mnote01](#), PHYS 213 GN(2) [\[1\]#mnote01](#), and PHYS 214 GN(2) [\[1\]#mnote01](#).

b. The first year of an accredited medical or dental postgraduate program.

For the B.S. degree in Premedicine, a minimum of 126 credits is required, with at least 18 credits at the 400 level.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits

(18 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)

(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:

(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM:

(Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 99 credits
(This includes 18 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GHA courses.)

PRESCRIBED COURSES (53 credits)
BIOL 110 GN(4) [11|#mnote01](#), BIOL 110 230W GN(4) [11|#mnote01](#), CHFM 110 GN(3) [11|#mnote01](#), CHEM 111 GN(1) [11|#mnote01](#), CHEM 112 GN(3) [11|#mnote01](#), CHEM 113 GN(1) [11|#mnote01](#), MATH 140 GQ(4) [11|#mnote01](#), MATH 141 GQ(4) [11|#mnote01](#), NUTR 251(3) [11|#mnote01](#) (Sem: 1-2)
H P A 101(3), PHIL 432(3) (Sem: 1-6)
CHEM 210(3) [11|#mnote01](#), CHEM 212(3) [11|#mnote01](#), CHFM 213(2) [11|#mnote01](#) (Sem: 3-4)
PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4) [11|#mnote01](#), PHYS 213 GN(2) [11|#mnote01](#), and PHYS 214 GN(2) [11|#mnote01](#) (Sem: 3-6)

ADDITIONAL COURSES (16-20 credits)
Select 4-5 credits from BIOL 220W GN(4), BIOL 240W GN(4), MICRB 201(3)/MICRB 202(2) (Sem: 3-8)
Select 3-4 credits from CMPSG 101 GQ(3), CMPSG 121 GQ(3), STAT 250 GQ(3) (Sem: 3-8)
Select 4-5 credits [11|#mnote01](#), from BIOL 421(4), BIOL 437(4), BIOL 472(3)/BIOL 473(2), MICRB 412(3)/422(2) (Sem: 5-8)
Select 5-6 credits [11|#mnote01](#), from B M B 400(2-3), B M B 401(3), B M B 402(3); or CHEM 450(3), CHEM 452(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (26-30 credits)
Select 0-8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from program list to total 8 credits) (Sem: 1-8)
Select 18-30 credits from program list (A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.) (Sem: 1-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Summer Session 2001

Blue Sheet Item #: 29-07-147

Review Date: 4/10/01

UCA Revision #1: 8/9/06

UCA Revision #2: 7/30/07

SC

Publications updated faculty in charge: 7/17/09

Science

University Park, Eberly College of Science (SC BA)

PROFESSOR ROBERT B. MITCHELL, in charge

The Science major is an interdisciplinary degree that aims to provide a broad, general education in science. The bachelor of arts (B.A.) curriculum is designed specifically for students who have education goals relating to scientific theory and practice and who require a high degree of flexibility to obtain their educational objectives. After completing foundation courses in calculus, chemistry, physics, and the life sciences, students will select additional science courses from designated areas. A large number of supporting credits permit students to readily include the B.A. requirement and significant breadth or specialization into their undergraduate curriculum. Some examples include minors in business, computer and information science, education, kinesiology, or other fields. The degree allows students to become familiar with both the theory and the practice of science. It can help prepare students for various careers in pharmaceutical, biotechnical, chemical, medical, and agricultural industries. The degree can also be tailored to meet the specific requirements of professional programs such as medical, dental, or pharmacy schools.

In order to be eligible for entrance to the Science major, a student must have: 1) attained at least a 2.00 cumulative grade-point average; 2) completed MATH 140 GQ(4) with a grade of C or better; and 3) completed at least two of the following courses, BIOL 110 GN(4); CHEM 110 GN(3); PHYS 211 GN(4) or PHYS 250 GN(4), with a grade of C or better.

TWO-YEAR PREPROFESSIONAL PREPARATION: The first two years of the Science major (62 credits) can meet the preprofessional needs of those interested in admission to some schools of pharmacy, physical therapy, optometry, nursing, and physician assistant training. Successful students can then transfer after two years of undergraduate study to the professional school to which they are admitted. Note, however, that no Penn State degree can be awarded after only two years (62 credits) of study in the Science major. Also, note that the abbreviated two-year curriculum alone does not prepare students for admission to professional schools of general medicine, veterinary medicine, or dental medicine. Consult with the Eberly College of Science health sciences professional adviser for additional information.

For the B.A. degree in Science, a minimum of 124 credits is required, with at least 15 credits at the 400 level.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

WRITING ACROSS THE CURRICULUM:
(Included in BACHELOR OF ARTS DEGREE REQUIREMENTS, GENERAL EDUCATION course selection, or REQUIREMENTS FOR THE MAJOR)

BACHELOR OF ARTS DEGREE REQUIREMENTS: 24 credits
(3 of these 24 credits are included in the REQUIREMENTS FOR THE MAJOR, GENERAL EDUCATION, or ELECTIVES and 0-12 credits are included in ELECTIVES if foreign language proficiency is demonstrated by examination.)
(See description of Bachelor of Arts Degree Requirements in this bulletin.)

REQUIREMENTS FOR THE MAJOR: 70-78 credits
(This includes 15 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses.)

PRESCRIBED COURSES (20 credits)
CHEM 110 GN(3) [11|#mnote01](#), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), MATH 140 GQ(4) [11|#mnote01](#), MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4) [11|#mnote01](#) (Sem: 1-4)

ADDITIONAL COURSES (17-23 credits)
PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4) [11|#mnote01](#), PHYS 251 GN(4) (Sem: 3-6)
Select 3-4 credits from CMPSG 101 GQ(3), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-6)
Select 3-4 credits from B M B 211(3), BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4), or MICRB 201(3) (Sem: 3-6)
Select 3 credits from PHIL 110 GH(3), PHIL 221 GH(3), S T S 100 GH(3), or S T S 200 GS(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (27-41 credits)
(A maximum of 12 credits of Independent Study (296, 496) may be applied toward credits for graduation.)
Select 15 credits in life, mathematical, or physical sciences, with at least 9 credits [11|#mnote01](#), at the 400 level [60|#mnote60](#) (Sem: 3-8)
Select 12-26 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

[60] Physical sciences include ASTRO, CHEM, PHYS; mathematical sciences include CMPSG, CSE, MATH, STAT; life sciences include BIOL, BIOTC, B M B, MICRB.

Last Revised by the Department: Summer Session 2001

Blue Sheet Item #: 29-07-148

Review Date: 04/10/01

UCA Revision #1: 8/14/06

SC

Science

Abington College (SCIAB)

Altoona College (SCIAL)

Berks College (SCIBL)

Capital College (SCICA)

University College (SCICC): Penn State York

University Park, Eberly College of Science (SC BS)

Integrated Five-Year Science/Business M.B.A. Program (SCBUS)

Not all options are available at every campus. Contact the campus you are interested in attending to determine which options are offered.

PROFESSOR RONALD MARKLE, in charge

The Science major is an integrated undergraduate-graduate (IUG) degree program that aims to provide a broad, general education in science. The bachelor of science (B.S.) curriculum is designed specifically for students who have education goals relating to scientific theory and practice and who require a high degree of flexibility to obtain their educational objectives. After completing foundation courses in calculus, chemistry, physics, and the life sciences, students will select additional science courses from designated areas. A large number of supporting credits permit students to readily include significant breadth or specialization into their undergraduate curriculum. Some examples include minors in business, computer and information science, education, kinesiology, or other fields. The degree allows students throughout the Commonwealth to become familiar with both the theory and the practice of science. It can help prepare students for various careers in pharmaceutical, biotechnical, chemical, medical, and agricultural industries. The degree can also be tailored to meet the specific requirements of professional programs such as medical, dental, or pharmacy schools. The General Science option of the B.S. Science degree allows for the most flexibility. Achievement in a more specialized set of goals can be met by selecting one of the other three B.S. options offered: the Life Sciences option, the Mathematical Sciences option, or the Physical Sciences option. Not all of these options are available at all locations, so see the Science program director at your College for further details.

In order to be eligible for entrance to the Science major, a student at any location must have: 1) attained at least a 2.00 cumulative grade-point average; 2) completed MATH 140 GQ(4) with a grade of C or better; 3) completed at least two of the following courses, BIOL 110 GN(4); CHEM 110 GN(3); PHYS 211 GN(4) or PHYS 250 GN(4), with a grade of C or better.

TWO-YEAR PREPROFESSIONAL PREPARATION: The first two years of the Science major (62 credits) can meet the preprofessional needs of those interested in admission to some schools of pharmacy, physical therapy, optometry, nursing, and physician assistant training. Successful students can then transfer after two years of undergraduate study to the professional school to which they are admitted. Note, however, that no Penn State degree can be awarded after only two years (62 credits) of study in the Science major. Also, note that the abbreviated two-year curriculum alone does not prepare students for admission to professional schools of general medicine, veterinary medicine, or dental medicine. Consult with your college's health sciences professional adviser for additional information.

ACCELERATED SCIENCE B.S./M.B.A. PROGRAM: Students admitted to this special cooperative program between the Eberly College of Science and The Smel College of Business will be able to combine a Bachelor of Science degree in the Science major, with a Master of Business Administration degree. Highly motivated students, who enter the University with a sufficient number and proper distribution of AP credits, will have the opportunity to complete the requirements for both programs within five years. The B.S. degree in the Science major General Science option, will be conferred upon satisfactory completion of:

1. A minimum of 112 acceptable undergraduate credits, which must include:

- (30 credits) The University's General Education requirements in the areas of Writing and Speaking (9), Health and Physical Activity (3), Arts (6), Humanities (6), and Social and Behavioral Sciences (6). (Note: Students will be required to take ECON 002 GS(3) and ECON 004 GS(3) in order to satisfy the Social and Behavioral Sciences requirement. The University's General Education requirements in the areas of Quantification and Natural Sciences will be satisfied by course work listed under heading "c.")
- The University's First-Year Seminar, United States Cultures, International Cultures, and Writing Across the Curriculum requirements. (Note: These requirements may be double counted in order to satisfy other requirements in the program.)
- (53-57 credits) BIOL 110 GN(4), CHEM 110 GN(3), CHEM 111(1), CHEM 112 GN(3), CHEM 113 GN(1), CMPSG 203 GQ(4), MATH 140 GQ(4), MATH 141 GQ(4), PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213

- GN(2), PHYS 214 GN(2), or PHYS 250 GN(4), PHYS 251 GN(4), STAT 200 GQ(4); an additional life science course selected from B M B 211(3), B M B 251(3), or MICRB 201(3); and 14 additional credits of course work from the Eberly College of Science, with at least nine credits at the 400 level.
4. (0-8 credits) Demonstration of second semester proficiency in a single foreign language.
 5. (3-9 credits) SC 295(1-3), SC 395(1-3), SC 495(1-3) (Note: Students must complete three Eberly College of Science Cooperative Education experiences, including at least one experience which is a full semester in length.)
 6. (4 credits) ACCTG 211(4)
 7. (4-22 credits) Supporting courses and related areas selected from the program list.
2. The first semester of course work in The Smeal College of Business M.B.A. program (i.e., a minimum of 12 graduate credits).

For the B.S. degree in Science, a minimum of 124 credits is required, with at least 15 credits at the 400 level.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in this bulletin.)

FIRST-YEAR SEMINAR:
(Included in GENERAL EDUCATION course selection or SUPPORTING COURSES AND RELATED AREAS)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in GENERAL EDUCATION course selection or SUPPORTING COURSES AND RELATED AREAS)

WRITING ACROSS THE CURRICULUM:
(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR or SUPPORTING COURSES AND RELATED AREAS)

REQUIREMENTS FOR THE MAJOR: 94 credits
(This includes 15 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses.)

COMMON REQUIREMENTS FOR MAJOR (ALL OPTIONS): 29-37 credits

PRESCRIBED COURSES (20 credits)
CHEM 110 GN(3) [11|#mnote01](#), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), MATH 140 GQ(4) [11|#mnote01](#), MATH 141 GQ(4) (Sem: 1-2)
BIOL 110 GN(4) [11|#mnote01](#) (Sem: 1-4)

ADDITIONAL COURSES (3 credits)
Select 3 credits from B M B 211(3), B M B 251(3), or MICRB 201(3) (Sem: 3-4)

SUPPORTING COURSES AND RELATED AREAS (6-14 credits)
Select 6 credits of 400-level courses (Sem: 5-8)
Select 0-8 credits in a foreign language (proficiency demonstrated by examination or course work to the level of the second semester; if fewer than 8 credits are needed to reach the required proficiency, students choose selections from program list to total 8 credits) (Sem: 1-8)

REQUIREMENTS FOR THE OPTION: 57-65 credits

GENERAL SCIENCE OPTION: (57-65 credits)

ADDITIONAL COURSES (11-16 credits)
Select 3-4 credits from CMPSC 101 GQ(3), MATH 230(4), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-4)
PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2), or PHYS 250 GN(4) [11|#mnote01](#), PHYS 251 GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (41-54 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 3 credits from earth and mineral sciences (Sem: 3-8)
Select 18 credits in life, mathematical, or physical sciences, with at least 9 credits [11|#mnote01](#), at the 400 level [160V|#mnote60](#), (Sem: 3-8)
Select 20-33 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

LIFE SCIENCE OPTION: (57-65 credits)

ADDITIONAL COURSES (21-27 credits)
Select 4 credits from BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4) (Sem: 3-4)
Select 3 credits from CMPSC 101 GQ(3), MATH 230(4), MATH 250(3), or STAT 200 GQ(4) (Sem: 3-4)
CHEM 202(3), CHEM 203(3), or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-6)
PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4) [11|#mnote01](#), PHYS 251 GN(4) (Sem: 3-6)

SUPPORTING COURSES AND RELATED AREAS (30-44 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits [11|#mnote01](#), of 400-level B M B, BIOL, BIOTC, or MICRB courses (Sem: 5-8)
Select 21-35 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

MATHEMATICAL SCIENCE OPTION: (57-65 credits)

PRESCRIBED COURSES (5 credits)
CMPSC 122(3), MATH 220 GQ(2-3) (Sem: 3-6)

ADDITIONAL COURSES (21-26 credits)
CMPSC 121 GQ(3), CMPSC 201 GQ(3), or CMPSC 202 GQ(3) (Sem: 3-6)
MATH 230(4) or MATH 251(4) (Sem: 3-6)
CMPSC 360(3) or MATH 11W(3-4), STAT 301 GQ(3) or STAT 318(3) (Sem: 3-8)
PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2); or PHYS 250 GN(4) [11|#mnote01](#), PHYS 251 GN(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (26-39 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits [11|#mnote01](#), of 400-level CMPSC, CSE, MATH, or STAT courses (Sem: 5-8)
Select 17-30 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

PHYSICAL SCIENCE OPTION: (57-65 credits)

PRESCRIBED COURSES (15 credits)
ASTRO 291 GN(3), PHYS 211 GN(4) [11|#mnote01](#), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2) (Sem: 3-6)

ADDITIONAL COURSES (13-16 credits)
CHEM 202(3), CHEM 203(3); or CHEM 210(3), CHEM 212(3), CHEM 213(2) (Sem: 3-6)
MATH 230(4) or MATH 251(4) (Sem: 3-6)
Select 3-4 credits from ASTRO 292 GN(3), E MCH 211(3); M E 300(3); or PHYS 237(3) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (26-37 credits)
(A maximum of 12 credits of Independent Study [296, 496] may be applied toward credits for graduation.)
Select 9 credits [11|#mnote01](#), of 400-level ASTRO, CHEM, or PHYS courses (Sem: 5-8)
Select 17-28 credits from program list (Students may apply 6 credits of ROTC.) (Sem: 1-8)

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.
[60] Physical sciences include ASTRO, CHEM, PHYS; mathematical sciences include CMPSC, MATH, STAT; life sciences include BIOL, BIOTC, B M B, MICRB.

Last Revised by the Department: Summer Session 2006

In charge professor updated by Publications: 4/30/09

Blue Sheet Item #: 34-06-352

Review Date: 4/11/06

UCA Revision #1: 9/1/06

UCA Revision #2: 7/730/07

SC

Statistics

University Park, Eberly College of Science (STAT)

PROFESSOR BRUCE G. LINDSAY, Head, Department of Statistics

This major helps prepare students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analysts, or for further graduate training in statistics. The major includes five options: An Actuarial Statistics Option for students interested in working as actuaries in the insurance or business fields; an Applied Statistics Option for students interested in a cross-disciplinary program, such as econometrics, or psychometrics; a Biostatistics Option for students interested in pursuing careers with pharmaceutical companies, research hospitals or other fields in which biological data is analyzed; a Graduate Study Option for students planning to go to graduate school in a statistics-related field; and a Statistics and Computing Option for students wishing to combine statistical expertise with programming skills.

In order to be eligible for entrance into the Statistics major, a student must have: 1) Attained at least a 2.00 cumulative grade point average. 2) Completed MATH 140 GQ(4) and MATH 141 GQ(4); and earned a grade of C or better in each of these courses.

For the B.S. degree in Statistics a minimum of 120 credits is required.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

GENERAL EDUCATION: 45 credits
(6-15 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR)
(See description of General Education in front of *Bulletin*.)

FIRST-YEAR SEMINAR:
(Included in ELECTIVES or GENERAL EDUCATION course selection)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES:
(Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM:
(Included in GENERAL EDUCATION course selection or REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 80-95 credits
(This includes 6-15 credits of General Education: 0-9 credits of GN courses; 6 credits of GQ courses, 0-6 credits of GS courses.)

COMMON REQUIREMENTS FOR THE MAJOR (ALL OPTIONS): 32-34 credits

PRESCRIBED COURSES (30 credits)
MATH 140 GQ(4) [11|#mnote01](#), MATH 141 GQ(4) [11|#mnote01](#) (Sem: 1-2)
MATH 220 GQ(2-3) [11|#mnote01](#), STAT 200(4) [11|#mnote01](#) (Sem: 3-4)
STAT 414(3) [11|#mnote01](#), STAT 415(3) [11|#mnote01](#), STAT 460(3) [11|#mnote01](#), STAT 462(3) [11|#mnote01](#), STAT 470W(3) [11|#mnote01](#), STAT 480(1) [11|#mnote01](#) (Sem: 5-8)

ADDITIONAL COURSES (2-4 credits)

MATH 230(4) [1]#mnote01_ or MATH 231(2) [1]#mnote01_ (Sem: 3-4)

REQUIREMENTS FOR THE OPTION: 48-60 credits

ACTUARIAL STATISTICS OPTION: 51-57 credits

Students who major in statistics with the actuarial statistics option and who wish to complete a concurrent major in mathematics may not choose the actuarial mathematics option in mathematics. Any other option in mathematics is acceptable.

PRESCRIBED COURSES (31 credits)

ECON 002 GS(3) FCON 004 GS(3) (Sem: 1-4)

ACCTG 211(4) [1]#mnote01_ FIN 100(3) [1]#mnote01_ (Sem: 3-4)

FIN 408(3) [1]#mnote01_ INS 301(3) [1]#mnote01_ INS 410(3) [1]#mnote01_ INS 411(3) [1]#mnote01_ INS 412(3) [1]#mnote01_ STAT 463(3) [1]#mnote01_ (Sem: 4-8)

ADDITIONAL COURSES (11-13 credits)

CMPS 101 GQ(3) [1]#mnote01_ CMPS 102(3) [1]#mnote01_ CMPS 121 GQ(3) [1]#mnote01_ CMPS 200 GQ(3) [1]#mnote01_ CMPS 201 GQ(3) [1]#mnote01_ or CMPS 202 GQ(3) [1]#mnote01_ (Sem: 1-4)

BA 242(2) [1]#mnote01_ or BA 243(4) [1]#mnote01_ (Sem: 3-8)

Select 6 credits from IE 424(3) [1]#mnote01_ MATH 436(3) [1]#mnote01_ or MATH 441(3) [1]#mnote01_ MATH 451(3) [1]#mnote01_ or MATH 455(3) [1]#mnote01_ STAT 416(3) [1]#mnote01_ STAT 440(3) [1]#mnote01_ STAT 461(3) [1]#mnote01_ STAT 464(3) [1]#mnote01_ STAT 466(3) [1]#mnote01_ (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (9-13 credits)

Select 9-13 credits from department list (Sem: 1-8)

APPLIED STATISTICS OPTION: (48-50 credits)

ADDITIONAL COURSES (15 credits)

Select 3 credits from: CMPS 101 GQ(3) [1]#mnote01_ CMPS 121 GQ(3) [1]#mnote01_ CMPS 201 GQ(3) [1]#mnote01_ or CMPS 202 GQ(3) [1]#mnote01_ (Sem: 1-4)

Select 12 credits from IE 433(3) [1]#mnote01_ MATH 436(3) [1]#mnote01_ or MATH 441(3) [1]#mnote01_ MATH 451(3) [1]#mnote01_ or MATH 455(3) [1]#mnote01_ STAT 416(3) [1]#mnote01_ STAT 440(3) [1]#mnote01_ STAT 461(3) [1]#mnote01_ STAT 463(3) [1]#mnote01_ STAT 464(3) [1]#mnote01_ STAT 466(3) [1]#mnote01_ (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (33-35 credits)

Select 33-35 credits from department list, including a minor in a supporting field other than Mathematics. (Sem: 1-8)

(If a student wants to work in a supporting field that does not have a minor, he or she can propose a list of six appropriate courses and petition the Statistics Department for approval. It is the student's responsibility to justify the appropriateness of the proposed list. Students must receive a grade of C or better in each of these six courses.)

BIOSTATISTICS OPTION: (56-60 credits)

PRESCRIBED COURSES (8 credits)

BIOL 110 GN(4) [1]#mnote01_ CHEM 110 GN(3) [1]#mnote01_ CHEM 111 GN(1) [1]#mnote01_ (Sem: 1-3)

ADDITIONAL COURSES (28-29 credits)

Select 3 credits from: CMPS 101 GQ(3) [1]#mnote01_ CMPS 121 GQ(3) [1]#mnote01_ CMPS 201 GQ(3) [1]#mnote01_ or CMPS 202 GQ(3) [1]#mnote01_ (Sem: 1-4)

Select 7-8 credits from BIOL 220W GN(4) [1]#mnote01_ BIOL 222(3) [1]#mnote01_ BIOL 230W GN(4) [1]#mnote01_ BIOL 240W GN(4) [1]#mnote01_ (Sem: 3-4)

Select 6 credits from 400-level BIOL courses [1]#mnote01_ (Sem: 5-8)

Select 12 credits from IE 433(3) [1]#mnote01_ MATH 436(3) [1]#mnote01_ or MATH 441(3) [1]#mnote01_ MATH 451(3) [1]#mnote01_ or MATH 455(3) [1]#mnote01_ STAT 416(3) [1]#mnote01_ STAT 440(3) [1]#mnote01_ STAT 461(3) [1]#mnote01_ STAT 463(3) [1]#mnote01_ STAT 464(3) [1]#mnote01_ STAT 466(3) [1]#mnote01_ (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (20-23 credits)

Select 20-23 credits from department list (Sem: 1-8)

GRADUATE STUDY OPTION: (48-50 credits)

A student completing the Graduate Study option will have earned a minor in mathematics in addition to a B.S. in Statistics. However, a student must fill out and submit the appropriate paperwork to the Mathematics Department in order for this minor to be officially recognized.

PRESCRIBED COURSES (9 credits)

MATH 312(3) [1]#mnote01_ MATH 403(3) [1]#mnote01_ MATH 404(3) [1]#mnote01_ (Sem: 5-8)

ADDITIONAL COURSES (24 credits)

Select 3 credits from: CMPS 101 GQ(3) [1]#mnote01_ CMPS 121 GQ(3) [1]#mnote01_ CMPS 201 GQ(3) [1]#mnote01_ or CMPS 202 GQ(3) [1]#mnote01_ (Sem: 1-4)

Select 9 credits from MATH 310(3) [1]#mnote01_ MATH 311W(3-4) [1]#mnote01_ MATH 421(3) MATH 422(3) [1]#mnote01_ MATH 426(3) MATH 429(3) MATH 456(3) [1]#mnote01_ MATH 468(3) [1]#mnote01_ MATH 469(3) [1]#mnote01_ (Sem: 7-8)

Select 12 credits from IE 433(3) [1]#mnote01_ MATH 436(3) [1]#mnote01_ or MATH 441(3) [1]#mnote01_ MATH 451(3) [1]#mnote01_ or MATH 455(3) [1]#mnote01_ STAT 416(3) [1]#mnote01_ STAT 440(3) [1]#mnote01_ STAT 461(3) [1]#mnote01_ STAT 463(3) [1]#mnote01_ STAT 464(3) [1]#mnote01_ STAT 466(3) [1]#mnote01_ (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15-17 credits)

Select 15-17 credits from department list (Sem: 1-8)

STATISTICS AND COMPUTING OPTION: (48-50 credits)

PRESCRIBED COURSES (9 credits)

CMPS 121 GQ(3) [1]#mnote01_ CMPS 122(3) [1]#mnote01_ CMPS 465(3) [1]#mnote01_ (Sem: 1-6)

ADDITIONAL COURSES (24 credits)

Select 3 credits from: CMPS 360(3) [1]#mnote01_ or MATH 311W(3-4) [1]#mnote01_ (Sem: 3-6)

Select 9 credits from: CMPS 221(3) [1]#mnote01_ 400-level CMPS [1]#mnote01_ other than CMPS/MATH 451 or CMPS/MATH 455 (Sem: 5-8)

Select 12 credits from IE 433(3) [1]#mnote01_ MATH 436(3) [1]#mnote01_ or MATH 441(3) [1]#mnote01_ MATH 451(3) [1]#mnote01_ or MATH 455(3) [1]#mnote01_ STAT 416(3) [1]#mnote01_ STAT 440(3) [1]#mnote01_ STAT 461(3) [1]#mnote01_ STAT 463(3) [1]#mnote01_ STAT 464(3) [1]#mnote01_ STAT 466(3) [1]#mnote01_ (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (15-17 credits)

Select 15-17 credits from department list (Sem: 1-8)

Integrated B.S. in Statistics and Master of Applied Statistics (M.A.S.)

The Integrated Undergraduate-Graduate (IUG) degree with B.S. in Statistics and Master of Applied Statistics (M.A.S.) is designed to be completed in five years. This integrated degree will enable a select number of highly qualified and career-oriented students to obtain training in statistics focused on developing data analysis skills and exploration of core areas of applied statistics at the undergraduate and graduate levels. The M.A.S. degree is a professional master's degree that emphasizes applications and does not provide as much training in the mathematical and statistical theory. The degree prepares students with interests in mathematics, computation, and the quantitative aspects of science for careers in industry and government as statistical analyst. Research divisions in the pharmaceutical industry, quality control and quality engineering divisions in manufacturing companies, clinical research units, corporate planning and research units, and other data-intensive positions require persons with training in mathematics, computation, database management, and statistical analysis, which this program will provide.

Application Process

The number of openings in the integrated B.S./M.A.S. program is limited. Admission will be based on specific criteria and the recommendation of faculty. Applicants to the integrated program:

1. Must be enrolled in the Statistics B.S. program.
2. Must have completed at least 60 credits of the undergraduate degree program including the two courses: STAT 414 and STAT 415, and the students must apply to the program prior to completing 110 credits.
3. Must submit a transcript and a statement of purpose.
4. Must present a departmental-approved plan of study in the application process in consultation with the M.A.S. program director.
5. Must be recommended by the chair of the department's undergraduate program committee.
6. Must be accepted into the M.A.S. program in Statistics.

For the IUG B.S./M.A.S. degree, 120 credits are required for the B.S. and 30 credits for the M.A.S. The following twelve graduate-level credits (number of credits in parentheses) can apply to both B.S. and M.A.S. degrees; six of these are at the 500 level:

STAT 414 (3) Introduction to Probability Theory
STAT 415 (3) Introduction to Mathematical Statistics
STAT 501 (3) Regression Methods
STAT 502 (3) Analysis of Variance and Design of Experiments

Assuming all requirements for the B.S. are completed, students in the program can complete the B.S. degree and not advance to the M.A.S. Degree if they desire.

Degree Requirements

IUG Statistics B.S. prescribed Statistics courses: See above, but note that students in IUG Statistics B.S. take STAT 501 and 502 instead of STAT 460 and 462.

IUG Statistics M.A.S. requirement (30 credits)

STAT 414 (3) Introduction to Probability Theory
STAT 415 (3) Introduction to Mathematical Statistics
STAT 501 (3) Regression Methods
STAT 502 (3) Analysis of Variance and Design of Experiments
STAT 580 (2) Statistical Consulting Practicum I
STAT 581** (1) Statistical Consulting Practicum II
Electives (15) Choose from STAT 503-510 and the departmental list of additional courses for the M.A.S. program with the approval of the adviser.

**For all students in the M.A.S. program, the STAT 581 course will have a comprehensive written project report required as part of the course, which serves as the culminating experience.

[1] A student enrolled in this major must receive a grade of C or better, as specified in Senate Policy 82-44.

Last Revised by the Department: Spring Semester 2010(STAT); Summer Session 2003 (Integrated B.S./M.A.S.)

Blue Sheet Item #: 38-01-056 (STAT); 31-01-123 (Integrated B.S./M.A.S.)

Review Date: 8/25/09

UCA Revision #1: 9/1/06

UCA Revision #2: 7/30/07

SC

Associate Degrees

Minors

Astronomy and Astrophysics Minor

University Park, Eberly College of Science (ASTRO)

The minor in Astronomy and Astrophysics, available at the University Park campus, provides educational options to students with interest in astronomy but with principal commitments to an allied field. It is designed principally for majors in Aerospace Engineering, Electrical Engineering, Engineering Sciences, Geosciences, Meteorology, and Physics. The educational objectives are to provide students with a profound understanding of the large-scale properties and processes in our Universe including planets and solar systems, our Sun and other stars, our Galaxy and other galaxies; and cosmology. Students in the minor survey the field in the 200-level sequence and then select from a choice of advanced astronomy and allied courses. Minors will be encouraged to take advantage of the many undergraduate research opportunities in the department, often using space-based observatories.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-19 credits

PRESCRIBED COURSES (6 credits)
ASTRO 291 GN(3), ASTRO 292 GN(3) (Sem: 3-4)

ADDITIONAL COURSES (6-7 credits)
Select 6-7 credits from additional ASTRO 400-level courses, AERSP 308(3), AERSP 312(4), E E 472(3), GEOSC 474(3), GEOSC 481(3), METEO 466(3), or PHYS 458(4) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6 credits)
Select 6 credits from 400-level ASTRO courses, except ASTRO 496 (Sem: 5-8)

Last Revised by the Department: Spring Semester 2002

Blue Sheet Item #: 30-03-111

Review Date: 05/22/02

UCA Revision #2: 7/26/07

SC

Biochemistry and Molecular Biology Minor

University Park, Eberly College of Science (B M B)

PROFESSOR PHILIP W. MOHR, in charge

The Biochemistry and Molecular Biology minor provides a foundation in traditional biochemistry and an exploration of the current understanding of molecular biology. The fields of biochemistry and molecular biology are extensively interconnected and are taught in the context of the biology of the cell. Stated another way, the B M B minor is a substantial treatment of life processes at the molecular and cellular levels. The minor requires coursework in general biochemistry, cell biology, and molecular biology. A required laboratory course exposes students to the basic techniques and instrumentation used in modern biochemistry and molecular biology laboratories. Students considering this minor should be comfortable with the study of chemistry.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES: (17 credits)
B M B 251(3), B M B 252(3), B M B 442(3) (Sem: 3-4)
B M B 400(2-3), B M B 401(2), B M B 402(3) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS: (1-3 credits)
Select 1-3 credits of B M B courses at the 400-level (Sem: 7-8)

Last Revised by the Department: Fall Semester 2001

Review Date: 8/11/03

SC

Biology Minor

Altoona College (BIOAL)

University Park, Eberly College of Science (BIOL)

This minor is designed for students in non-Life Science majors, who desire to obtain an in-depth and well-rounded knowledge of Biology -- the science of life and living organisms. This minor is not intended for "Life Science" oriented majors, including Biological Anthropology, Premedicine, and Science, Life Science option. After taking an introductory survey course which exposes students to the basics of Biology, including the chemistry of life, cell structure, genetics, mechanisms of evolution and evolutionary history of biological diversity, plant and animal form and function, and ecology, students select additional courses based on their biological emphasis to account for a total of 18-20 credits. In conjunction with the student's major, the minor prepares students for entry to graduate school or professional school programs, as well as for technical or research careers with governmental agencies or industry. Majors complemented by this minor would include but not be limited to other life and physical sciences, engineering, and business.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18-20 credits

PRESCRIBED COURSES (4 credits)
BIOL 110 GN(4) (Sem: 5-6)

ADDITIONAL COURSES (7-8 credits)
Select 7-8 credits from BIOL 129 GN(4), BIOL 141 GN(3), BIOL 142(1), BIOL 222(3), BIOL 220W GN(4), BIOL 230W GN(4), BIOL 240W GN(4), BIOL 322(3) (Sem: 5-8)

SUPPORTING COURSES AND RELATED AREAS (6-9 credits)
Select 6-9 credits from 400-level Biology courses (BIOL 400, BIOL 496, and SC 495 credits may not be used to fulfill this requirement.) (Sem: 5-8)

Last Revised by the Department: Fall Semester 2007

Blue Sheet Item #: 35-06-521

Review Date: 4/10/07

Chemistry Minor

University Park, Eberly College of Science (CHEM)

PROFESSOR Mark Maroncelli, Assistant Head for Undergraduate Education

The Chemistry minor specifies a series of courses that together provide a broad introduction to the main thrusts of modern chemistry: general, organic, and physical. The Chemistry minor includes substantial laboratory work including general chemistry and either organic or physical chemistry. In addition, several advanced courses chosen by the student from a list of options are required.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 27-29 credits

PRESCRIBED COURSES: (17 credits)
CHEM 110 GN(3), CHEM 111 GN(1), CHEM 112 GN(3), CHEM 113 GN(1), CHEM 210(3), CHEM 212(3) (Sem: 1-4)
CHEM 452(3) (Sem: 5-8)

ADDITIONAL COURSES: (10-12 credits)
CHEM 457 and CHEM 466 can only be used to satisfy the requirements of one category below.
Select 2 credits from CHEM 213(2) or CHEM 457(2) (Sem: 3-8)
Select 3 credits from CHEM 450(3) or CHEM 466(3) (Sem: 5-8)
Select 5-7 credits from CHEM 402(3), CHEM 406(3), CHEM 408(3), CHEM 410(3), CHEM 412(3), CHEM 423(3), CHEM 425(3), CHEM 427W(4), CHEM 430(3), CHEM 431W(3), CHEM 448(3), CHEM 457(2), CHEM 460(3), CHEM 462(3), CHEM 464(3), CHEM 466(3), or CHEM 476(3) (Sem: 5-8)

Last Revised by the Department: Summer Session 2008

Blue Sheet Item #: 36-05-087

Review Date: 2/26/08

UCA Revision #1: 9/20/06

SC

Information Sciences and Technology for Mathematics Minor

University Park, Eberly College of Science (ISMTH)

University Park, College of Information Sciences and Technology

The interaction between Information Sciences and Mathematics will continue developing in remarkable new directions. Mathematical scientists enormously benefit from information technology in the performance of research, in communicating and disseminating scientific information and results, as well as in career environments involving data analysis and management. Mathematicians also contribute to making inroads toward the development of new information technologies. Information sciences and technology are already playing a very important role in mathematical education, at all levels, and will experience an overwhelming increase in the near future. Giving undergraduate mathematics students the opportunity to minor in IST will not only enrich their educational achievements but it will also help them succeed in the employment searches.

Students must apply for entrance to the minor no later than the beginning of their senior year. A one-time tuition surcharge will be applied to all students enrolled in the minor.

A grade of C or better is required in all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 19 credits

PRESCRIBED COURSES (10 credits)

IST 110 GS(3) (Sem: 1-2)
IST 210(4) Sem: 3-4
IST 220(3) (Sem: 5-6)

ADDITIONAL COURSES (9 credits)

Select 9 credits from the following 400-level mathematics courses: MATH 451(3), MATH 457(3), MATH 459(3), MATH 465(3), MATH 467(3), MATH 468(3), MATH 469(3) (Sem: 5-8)

Last Revised by the Department: Fall Semester 2001

Blue Sheet Item #: 29-01-084

Review Date: 10/06/05

SC

PIC updated by Publications: 3/26/09

Mathematics Minor

Altoona College (MTHAL)
University Park, Eberly College of Science (MATH)

PROFESSOR JOHN ROE, *Chair, Department of Mathematics*

The minor is designed to provide students with an interest in mathematics an opportunity to study a broad range of mathematical topics. The requirements allow students a great deal of flexibility in choosing courses of interest.

A grade of C or better is required for all courses in the minor.

Scheduling recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 26-28 credits

PRESCRIBED COURSES (8 credits)

MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-4)

ADDITIONAL COURSES (6-8 credits)

Select 6-8 credits from MATH 220 GQ(2-3), MATH 230(4), MATH 231(2), MATH 232(2), MATH 250(3), MATH 251(4), MATH 310(3), MATH 311W(3-4), or MATH 312(3) (Sem: 1-4)

SUPPORTING COURSES AND RELATED AREAS (12 credits)

Select 12 credits of 400-level MATH courses (Sem: 5-8)

Last Revised by the Department: Fall Semester 2001

Review Date: 5/10/04

UCA Revision #1: 8/9/06

Dept head updated by Publications: 3/26/09

Microbiology Minor

University Park, Eberly College of Science (MICRB)

PROFESSOR PHILIP W. MOHR, *in charge*

The minor in Microbiology is a collection of required and elective courses that (1) provides a limited but sound foundation in the discipline, (2) requires students to develop reasonable expertise in handling and characterizing microorganisms, and (3) permits students to emphasize some subdiscipline of microbiology in which they may have a particular interest. The minor specifies the introductory lecture and laboratory courses in microbiology and one course each in immunology and cell biology. A minimum of two laboratory courses exposes students to basic and experimental/applied techniques. Sufficient room exists within the minor for selection of two or three elective courses at the advanced level that may emphasize a specialty area of the discipline such as virology or microbial genetics. Students who complete the minor have a sufficient background to pursue positions in industry that require an appreciable expertise in microbiology.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 18 credits

PRESCRIBED COURSES (11 credits)

MICRB 201(3), MICRB 202(2), MICRB 251(3) (Sem: 3-4)

MICRB 410(3) (Sem: 5-6)

ADDITIONAL COURSES (2-3 credits)

Select 2-3 credits from MICRB 421W(3) or MICRB 422(2) (Sem: 5-6)

SUPPORTING COURSES AND RELATED AREAS (4-5 credits)

Select 4-5 of 400-level MICRB courses (Sem: 5-8)

Note: MICRB 400(2), MICRB 408(1-2), MICRB 496(1-18) and MICRB 497(1-9) may not be used to fulfill the requirements for the minor.

Last Revised by the Department: Fall Semester 2001

Review Date: 8/11/03

SC

Natural Science Minor

Altoona College (NTSAL)

Berks College (NTSBL)

University Park, Eberly College of Science (NATSC)

PROFESSOR ROBERT B. MITCHELL, *in charge*

This interdepartmental minor in Natural Science is designed for nonscience students who wish to gain a better appreciation for science and the scientific method. The courses required in the minor include 3 to 4 credits of general education science designed for nonscience students, 3 to 4 credits of mathematical science, 8 to 9 credits of life or physical science, including some laboratory work, and 6 credits of 400-level science courses. Certain combinations of courses are disallowed (as listed in the curriculum description), and higher-level courses are generally accepted as substitutes for lower-level courses if both are offered by the same department. Any substitutes for laboratory courses must also be laboratory courses. Advising for students in this minor will be available through the Eberly College of Science Academic Advising Center and approval of curriculum exceptions will be through the faculty committee and professor in charge of the program.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 20-23 credits

PRESCRIBED COURSE (1 credit)

SC 400(1) (Sem: 5-8)

ADDITIONAL COURSES (14-17 credits) [\[62\]#mnote63](#)

Select 3-4 credits from ASTRO 001 GN(3), ASTRO 010 GN(2) and ASTRO 011 GN(1), B M B 001 GN(3), BI SC 001 GN(3), BI SC 002 GN(3), BI SC 003 GN(3), BI SC 004 GN(4), CHEM 001 GN(3), CHEM 003 GN(3), MICRB 106 GN(3) and MICRB 107 GN(1); PHYS 001 GN(3) (Sem: 1-4)

Select 3-4 credits from CMPS 101 GQ(3), CMPS 121 GQ(3), CMPS 201 GQ(3) or CMPS 202 GQ(3), CMPS 203 GQ(4), MATH 110 GQ(4), MATH 140 GQ(4), STAT 200 GQ(4), STAT 250 GQ(3) (Sem: 3-6)

Select 8-9 credits from BIOL 011 GN(3) and BIOL 012 GN(1), BIOL 110 GN(4), CHEM 110 GN(3) and CHEM 111 GN(1), CHEM 112 GN(3) and CHEM 113 GN(1), MICRB 201(3) and MICRB 202(2), PHYS 250 GN(4), PHYS 251 GN(4) (Sem: 3-8)

SUPPORTING COURSES AND RELATED AREAS (5 credits)

Select 0-2 credits of 496 (independent studies) courses from the Eberly College of Science course offerings (Sem: 5-8)

Select 3-5 credits of 400-level courses (other than independent studies) from the Eberly College of Science course offerings (Sem: 5-8)

[62] A student may not use credit for BI SC 001 GN(3) or BI SC 002 GN(3) along with credit for BIOL 011 GN(3) and BIOL 012 GN(1), or BIOL 110 GN(4); CHEM 001 GN(3) or CHEM 003 GN(3) along with credit for CHEM 110 GN(3) and CHEM 111 GN(1) or CHEM 112 GN(3) and CHEM 113 GN(1); PHYS 001 GN(3) along with credit for PHYS 250 GN(4) or PHYS 251 GN(4); MICRB 106 GN(3) and MICRB 107 GN(1) along with credit for MICRB 201(3) and MICRB 202(2).

Last Revised by the Department: Summer Session 1995

Blue Sheet Item #: 23-04-042

Review Date: 9/13/02

UCA Revision #1: 8/9/06

UCA Revision #2: 7/30/07

Physics Minor

University Park, Eberly College of Science (PHYS)

PROFESSOR JAYANTH R. BANAVAR, *Head of the Department*

The Department of Physics offers a minor for students who wish to expand upon their study in this fundamental discipline, beyond the introductory courses (PHYS 211, PHYS 212, PHYS 213, PHYS 214). In addition to an additional course in modern physics (which includes introductions to relativity and quantum theory, as well as applications), students are required to take the 'core' of the junior-senior level Physics curriculum, with classes in advanced classical mechanics, electricity and magnetism, and quantum mechanics. The Physics minor is useful for students in many science (especially astronomy/astrophysics and chemistry) and engineering disciplines who wish to extend their studies in this fundamental field, as a background for graduate study or work in a variety of technical fields.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 24-26 credits

PRESCRIBED COURSES (21-22 credits)

PHYS 211 GN(4), PHYS 212 GN(4), PHYS 213 GN(2), PHYS 214 GN(2), PHYS 237(3) (Sem: 1-4)

PHYS 410(3-4), PHYS 419(3) (Sem: 5-8)

ADDITIONAL COURSES (3-4 credits)

PHYS 400(3) or E E 330(4) (Sem: 5-8)

Last Revised by the Department: Summer Session 2006

Blue Sheet Item #: 34-06-351

Review Date: 4/11/06

UCA Revision #1: 8/31/06

SC

Statistics Minor

University Park, Eberly College of Science (STAT)

PROFESSOR JAMES L. ROSENBERGER, Head, Department of Statistics

The Statistics minor introduces students to the quantitative aspects of research. Understanding statistics is useful for research in many areas including agriculture, business, education, social science and sciences as well as many jobs in industry and government.

A grade of C or better is required for all courses in the minor.

Scheduling Recommendation by Semester Standing given like (Sem: 1-2)

REQUIREMENTS FOR THE MINOR: 21 credits

PRESCRIBED COURSES (9 credits)

MATH 140 GQ(4), MATH 141 GQ(4) (Sem: 1-2)

STAT 480(1) (Sem: 5-8)

ADDITIONAL COURSES (12 credits)

Select 6 credits from STAT 318(3) and STAT 319(3) or STAT 414(3) and STAT 415(3) (Sem: 3-8)

Select 6 credits from STAT 416(3), STAT 440(3), STAT 460(3), STAT 462(3), STAT 463(3) or STAT 464(3) (Sem: 5-8)

Last Revised by the Department: Spring Semester 2010

Blue Sheet Item #: 38-01-055

Review Date: 8/25/09

SC

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