

Addictions Counselor Preparation

Professional Certification Program

Certificate

Contact:

Department of Psychology

- You cannot major or minor in addictions counseling.
- You may receive credit-by-examination for the following courses: PSYC 386, 387, 388, 389, 417.

- Since the Addictions Counseling program is a regional collaboration with Allegany College of Maryland, with shared courses and faculty, you may count enrollments at either Frostburg State University or Allegany College of Maryland to meet the requirement that at least one-half of the credit hours required in the certificate be completed in residence. In addition, grades from courses completed while enrolled through Allegany will count in determining whether you meet the 2.0 minimum grade point average in certificate courses.

Addictions Counselor Preparation

The Board of Professional Counselors and Therapists oversees the following regulations for Addictions Counselors in Maryland. There are three levels of certification, two of which are relevant to the undergraduate student and are briefly described below. For complete requirements for certification, please contact:

Board of Professional Counselors and Therapists
4201 Patterson Avenue
Baltimore, Maryland 21215-2299
(410) 764-4732

Certified Supervised Counselor – Alcohol and Drug (CSC-AD): 15 credit hours of alcohol and drug counselor training required and an associate's degree in a health or a human service counseling field.

Certified Associate Counselor – Alcohol and Drug (CAC-AD): 20 credit hours of alcohol and drug counselor training required and a bachelor's degree in a health or human services counseling field.

At FSU, students majoring in psychology or social work are automatically eligible, while majors in law and society or sociology will be considered on a case-by-case basis. Completing one of these degree programs AND taking the required alcohol and drug counselor training courses, are the first steps in meeting certification requirements. At the bachelor's degree level you must also have at least three years or 3000 hours of supervised experience and two years of the experience must have been completed after the award of the degree. You will also have to pass an examination selected by the Board.

The credit hour requirement must be satisfied from the following content areas. Each area is followed by the appropriate FSU course(s); all are 3 credit courses except Ethics. Please be aware that although bachelor's degree counselors need only 20 credit hours from the following list to satisfy the course requirement, **your examination will cover ALL CONTENT AREAS.**

1. Pharmacology of Psychoactive Drugs	PSYC 386
2. Individual Counseling Techniques	PSYC 410, SOWK 379
3. Group Therapy Techniques	PSYC 385, SOWK 473
4. Abnormal Psychology	PSYC 417
5. Addictions Treatment Delivery	PSYC 387
6. Treatment Issues and Theory in Addictions	PSYC 388
7. Family Counseling*	no undergraduate course offered
8. Theories of Counseling and Psychotherapy	no undergraduate course offered
9. Human Life Span Development	PSYC 210 and 212, SOWK 375
10. Ethics for the Addiction Counselor (1 credit hour)	PSYC 389

* Although FSU does not currently offer an undergraduate course in family counseling, SOWK majors taking SOWK 470, *Generalist Practice with Individuals and Families*, will find this course helpful in their preparation for family counseling issues covered on the examination.

Addictions Counseling Certificate

If you would like to get a head start on professional certification for addictions counselors, you may complete the following undergraduate certificate as a degree-seeking or non degree-seeking student. You still must complete a bachelor's degree in one of the human services fields noted above as well as complete additional course work in order to sit for the state exam.

Required Courses:

(16 hours)

PSYC 150 General Psychology
PSYC 386 Drugs and Human Behavior
PSYC 387 Addictions Treatment Delivery
PSYC 388 Treatment Issues and Theory in Addictions
PSYC 389 Ethics for the Addiction Counselor

ONE of the following:

SOWK 379 or PSYC 410 Foundations for Generalist Practice OR Introduction to Counseling
SOWK 473 or PSYC 385 Generalist Practice with Groups OR Group Processes

African American Studies

Minor

Coordinator:

Robert M. Moore,
Associate Professor,
Department of Sociology

Professor:

Bullamore (Geography)

Associate Professors:

Makang (Philosophy),
Moore (Sociology),
O'Rorke (Political Science),
Redmond-Matz
(Psychology), Rhodes
(Visual Arts), Saku
(Geography)

Assistant Professor:

Abbay (History)

- You may minor in African American Studies. There is no major available.
- All courses in African American Studies may be taken whether or not you wish to pursue the minor.
- A listing of Special Topics courses offered for the minor in future semesters is available through the Coordinator.

	For Minor
Hours Required in African American Studies:	9
Hours Required in Other Departments:	12
Total Hours Required:	21

Summary of Requirements for Minor in African American Studies

Minor

1. Required Core Courses:

(9 hours)

AAST 200 Introduction to African American Studies (*GEP Group F*)
AAST 300/HIST 301 Traditional Africa
AAST 400 Africans of the Diaspora (*GEP Group F*)

2. Elective Courses:

(12 hours)

A minimum of 3 hours must be taken from Humanities, and 3 hours from Social Sciences.

Humanities:

ART 302 Artistic Traditions: Africa and the Americas (*GEP Group F*)
ENGL 231 African American Literature
HIST 453 Contemporary Africa
PHIL 311 Asian and African Philosophy (*GEP Group F*)
Special Topics courses numbered 290, 403, 490, or 491 when approved by Coordinator

Social Sciences:

GEOG 324 Urban Geography: Internal City Patterns
GEOG 403 Geography of Sub-Saharan Africa
POSC 330 Politics of Africa
PSYC 418 Social Psychology
PSYC 450 Multicultural Counseling
SOCI 305 Racial and Cultural Minorities (*GEP Group F*)
SOCI 306 The Sociology of African Americans
Special Topics courses numbered 290, 403, 490, or 491 when approved by Coordinator

Other:

AAST 490 Special Topics in African American Studies
AAST 494 Practicum - limited to one 3 hour total enrollment
PHEC 415 The Black Athlete in American Society
Independent Studies courses numbered 499 when approved by the Coordinator, limited to one 3-hour total enrollment.

Art & Design

Major

Teaching Certification Option

Professors:

Brown, Davis, Dieruf,
Llewellyn

Associate Professor:

Rhodes (chair)

Assistant Professor:

Herzfeld, Hodges

- If you complete the major in Art & Design, you will earn the Bachelor of Fine Arts (BFA) degree.
- Minors are offered in art history, fine arts, and graphic design. A certificate is offered in Computer Print Graphics. See separate sections of catalog.
- You must successfully pass the 30 hour Studio Focus Review and Senior Review.
- You must successfully complete ART 207 Graphic Design by the time you earn 45 credit hours. ART 207 also provides instruction in technology fluency and information literacy for BFA candidates.
- Only courses in which a grade of C or better is earned may count towards satisfaction of major and minor requirements.
- Optional internships are available to qualifying students, particularly in graphic design. Student interns have been placed in government services, design studios, public relations firms and advertising businesses.
- You may elect the teaching certification option (internship required) as part of your bachelor's degree or complete the MAT Secondary/K-12 in art education (See Graduate Catalog).

	For Major	For Teaching Cert. Option
Hours Required in Art:	60	60
Hours Required in Other Departments:	0	38.5
Total Hours Required:	60	98.5

Summary of Requirements for BFA in Art & Design

Major

1. Basic Courses:

(12 hours)

ART 104 Two-Dimensional Design
ART 105 Three-Dimensional Design
ART 212 Drawing
ART 412 Advanced Drawing

2. Introductory Studio:

(18 hours)

ART 207 Graphic Design (*Tech. Fluency*)

And choose five courses from:

ART 202 Ceramics
ART 207 Graphic Design
ART 221 Painting
ART 232 Printmaking
ART 235 Photography
ART 240 Sculpture
ART 307 Computer Graphics or 236 Digital Imaging

Note: Students wishing to specialize in Graphic Design must include 235, 307.

Students seeking certification to teach art must include 202, 221, 232, 240.

3. Studio Focus Review:

(0 hours)

ART 291 Studio Focus Review

4. Art History and Critical Studies:

(12 hours)

ART 301 Artistic Traditions: Asia (*GEP Group F*)
or ART 302 Artistic Traditions: Africa and the Americas (*GEP Group F*)
ART 360 Western Art History
ART 408 20th Century Art History
ART 415 Art Criticism

5. Advanced Studio Focus

(15 hours - 12 credit hours in focus and 3 credit hours in secondary area.)

ART 402 Advanced Ceramics
ART ___* Advanced Graphic Design
ART 421 Advanced Painting
ART 432 Advanced Printmaking
ART 435 Advanced Photography
ART 440 Advanced Sculpture

*ART 407 Advanced Graphic Design:

Print and Video Media

*ART 414 Advanced Graphic Design: Interactive
Multimedia Design

OR

Dual-Media Studio Focus+

(15 hours - 9 credit hours in focus and 6 hours in secondary area.)

+Note: Only students seeking certification to teach art may have a Dual-Media focus in Graphic Design.

6. Senior Portfolio:

(3 hours)

ART 411 Senior Portfolio (*Capstone*) (co-registration in ART 491 required)

7. Senior Review:

(0 hours)

ART 491 Senior Review (co-registration in ART 411 required)

Summary of Requirements for Teaching Certification Option in Art

If you wish to complete a Maryland State approved program in teaching Art, you must:

- Complete the BFA in Art and Design.
- Select the following courses in partial fulfillment of the Introductory Studio requirement:
 - ART 202 Ceramics
 - ART 221 Painting
 - ART 232 Printmaking
 - ART 240 Sculpture
- Meet the phase admissions requirements summarized in the Educational Professions section.
- Complete the professional education sequence described in Education: K-12 Programs.

Art History

Minor

	For Minor
Hours Required in Art:	15-18
Hours Required in Other Departments:	3-0
Total Hours Required:	18

Summary of Requirements for Minor in Art History

Minor

Professors:

Brown, Davis, Dieruf,
Llewellyn

Associate Professor:

Rhodes (chair)

Assistant Professor:

Herzfeld, Hodges

- Minors are also offered in fine arts and graphic design. A major is offered in Art & Design. See separate listings in this catalog.
- Only courses in which a grade of C or better is earned may count towards satisfaction of major and minor requirements.
- You cannot major in Art History.

1. Basic Courses:

(3 hours)

Choose from:

ART 100 Art Appreciation (*GEP Group A*)

HIST 100 The Twentieth Century World (*GEP Group B or Group F*)

2. Core Courses:

(12 hours)

ART 301 Artistic Traditions: Asia (*GEP Group F*)

or ART 302 Artistic Traditions: Africa and the Americas (*GEP Group F*)

ART 360 Western Art History

ART 408 20th Century Art History

ART 415 Art Criticism

3. Elective:

(3 hours)

Choose from:

ART 370 Women/Gender and the Visual Arts

ART 380 19th Century Art History

ART 430 Greek and Roman Art

ART 460 Renaissance and Baroque Art History

Biology

	For Major	For Minor	Pre-Health Prof. Option	Biotech. Concen.	Env. Science Concen.	Teaching Cert. Option
Hours Required in Biology:	40-41	24	40-41	43-44	42	40-41
Hours Required in Other Depts.:	32	0	32	39-40	43	74.5
Total Hours Required:	72-73	24	72-73	82-84	85	114.5-115.5

Major

Minor

Pre-health Professions Option

Concentrations in

- biotechnology
- environmental science

Teaching Certification Option

See related programs:

- environmental analysis & planning
- ethnobotany
- forestry
- interpretive biology & natural history
- wildlife & fisheries

Professors:

Harman, Morton, Raesly,
Yoder

Associate Professors:

Li, Pegg, Seddon (Chair),
Serfass

Assistant Professors:

Ammer, Fritz, Ghioca

- You may elect the teaching certification option (internship required). Select the biology major without concentration to meet certification requirements.

Summary of Requirements for Major/Minor in Biology

Major	Minor
<p>1. Introductory Level Courses: (8 hours) BIOL 149 General Biology I (GEP Group C) BIOL 150 General Biology II</p> <p>2. Advanced Level Courses: (16 hours) BIOL 304 Microbiology BIOL 310 Cell Biology BIOL 340 General Ecology BIOL 350 Genetics BIOL 496 Seminar in Biology (Capstone)</p> <p>3. Distribution Within Department: (16-17 hours) Total of 4 courses in 3 groups; at least 1 in each group: Group I BIOL 302 Animal Physiology BIOL 303 Plant Physiology Group II BIOL 411 Invertebrate Zoology Either BIOL 327 Comparative Anatomy or BIOL 426 Vertebrate Zoology Group III BIOL 311 Morphology of Fungi and Non-Vascular Plants BIOL 312 Morphology of Vascular Plants</p> <p>4. Elective Hours in Department: (0 hours)</p> <p>5. Required Courses in Other Departments: Chemistry: (18 hours) CHEM 101, 102 General Chemistry (CHEM 101-GEP Group C) CHEM 301, 302 Organic Chemistry Mathematics: (6 hours) MATH 209 Elements of Applied Probability & Statistics (Core Skill 3) or MATH 219 Honors: Elements of Applied Probability & Statistics (Core Skill 3) Select one from: MATH 102 College Algebra (Core Skill 3) MATH 103 Trigonometry MATH 120 Pre-Calculus Mathematics (Core Skill 3) or any course above 210 Physics: (8 hours) PHYS 215, 216 General Physics I and II (PHYS 215-GEP Group C) or PHYS 261, 262 Principles of Physics I and II (PHYS 261-GEP Group C)</p>	<p>(8 hours) BIOL 149 General Biology I (GEP Group C) BIOL 150 General Biology II</p> <p>(16 hours) Select from biology courses at the 200 level or higher.</p>

- Biology is often selected as a major by students planning to enter medicine and other health professions careers. If you plan advanced study in the health professions, you should choose the pre-health professions option.
- If you are a pre-physical therapy or pre-occupational therapy student, you should consult individual allied health program listings for specific program requirements. If you are interested in pursuing graduate studies in other areas of Biology, you should not choose this option.

Pre-Health Professions Option for Biology Majors

(Pre-Dental, Pre-Medical, Pre-Optometry and Pre-Veterinary)

1. Introductory Level Courses:

(8 hours)

BIOL 149 General Biology I (*GEP Group C*)

BIOL 150 General Biology II

2. Advanced Level Courses:

(28-29 hours)

BIOL 302 Animal Physiology*

BIOL 304 Microbiology

BIOL 310 Cell Biology

BIOL 311 Morphology of Fungi and Non-Vascular Plants

or BIOL 312 Morphology of Vascular Plants

BIOL 327 Comparative Anatomy*

BIOL 340 General Ecology

BIOL 350 Genetics

BIOL 496 Seminar in Biology (*Capstone*)

3. Elective Hours in Biology Department:

(4 hours)

Choose one course:

BIOL 306 Vertebrate Embryology

BIOL 404 Histology

BIOL 412 General Parasitology

**Only students interested in a career in Physical Therapy or Occupational Therapy should take BIOL 201 (Anatomy and Physiology I) and BIOL 202 (Anatomy and Physiology II) in place of BIOL 302 (Animal Physiology) and BIOL 327 (Comparative Anatomy). All other program requirements are the same as for the Pre-Health Professions Option for Biology Majors.*

4. Required Advanced Courses in Other Departments:

(32 hours)

Same as major. See #5 above.

- The biotechnology concentration in biology offers you an interdisciplinary program with a strong emphasis on laboratory experiences in biology and chemistry, while maintaining a strong biology core. The option is best suited for students who wish to pursue an advanced degree in cell or molecular biology or to find employment in the biotechnology industry.

Summary of Requirements for Major in Biology - Biotechnology Concentration

1. Introductory Level Courses:

(8 hours)

BIOL 149 General Biology I (*GEP Group C*)

BIOL 150 General Biology II

2. Advanced Level Courses:

(15 hours)

BIOL 304 Microbiology

BIOL 310 Cell Biology

BIOL 340 General Ecology

BIOL 350 Genetics

3. Biotechnology Option:

(17 hours)

BIOL 401 Genetics Lab

BIOL 435 Molecular Biology

BIOL 437 Molecular Biology Seminar (*Capstone*)

BIOL 438 Biotechnology Laboratory (*3 hours*)

BIOL 440 Developmental Biology

BIOL 445 Immunology

4. Select one from:*(3-4 hours)*

BIOL 302 Animal Physiology
 BIOL 303 Plant Physiology
 BIOL 404 Histology
 BIOL 436 Electron Microscopy
 BIOL 499 Special Problems in Biology
 or IDIS 493 Honors Thesis

5. Required Courses in Other Departments:**Chemistry:***(25 hours)*

CHEM 101 General Chemistry I (*GEP Group C*)
 CHEM 102 General Chemistry II
 CHEM 301 Organic Chemistry I
 CHEM 302 Organic Chemistry II
 CHEM 455 Biochemistry I
 CHEM 456 Biochemistry Lab
 CHEM 457 Biochemistry II

Mathematics:*(6-7 hours)*

MATH 209 Elements of Applied Probability & Statistics (*Core Skill 3*)
 or Math 219 Honors: Elements of Applied Probability & Statistics (*Core Skill 3*)

Select one from:

MATH 220 Calculus for Applications I
 MATH 236 Calculus I (*Core Skill 3*)

Physics:*(8 hours)*

PHYS 215, 216 General Physics I and II (*PHYS 215 - GEP Group C*)
 or PHYS 261, 262 Principles of Physics I and II (*PHYS 261 - GEP Group C*)

- For students interested in the stewardship of natural resources with a greater emphasis on economic and political perspectives.
- This concentration allows you to choose electives in economics, political science and the humanities which potentially add a thematic direction to your degree.
- You should not choose this concentration if you are in pre-health professions or planning to attend a traditional biology graduate program.

Summary of Requirements for Major in Biology - Environmental Science Concentration**1. Introductory Level Courses:***(18 hours)*

BIOL 149 General Biology I (*GEP Group C*)
 BIOL 150 General Biology II
 ECON 201/211* Macroeconomics (*GEP Group D*)
 GEOG 103/113* Physical Geography (*GEP Group C*)
 POSC 110/112* Introduction to American Politics (*GEP Group D*)
 or POSC 113/114* Introduction to World Politics (*GEP Group D*)
 or POSC 131 Introduction to Comparative Politics (*GEP Group D or F*)
(Check the prerequisites for other POSC courses before choosing your introductory POSC course)

2. Advanced Level Courses:*(40 hours)*

BIOL 200 Scientific Investigation and Communication
 BIOL 304 Microbiology
 BIOL 310 Cell Biology
 BIOL 340 General Ecology
 BIOL 350 Genetics
 BIOL 406 Ornithology
 or BIOL 423 Mammalogy
 or BIOL 426 Vertebrate Zoology
 BIOL 425 Forest Science
 BIOL 450 Ecology and Management of Wildlife Populations
 or BIOL 420 Fish Management and Culture
 GEOG 473 Environmental Law
 ECON 202 Microeconomics
 BIOL 494 Field Experiences in Biological Sciences (*Capstone - 6 credits*)

3. Required Supporting Courses:*(18 hours)*CHEM 101 General Chemistry I (*GEP Group C*)

CHEM 102 General Chemistry II

CHEM 420 Environmental Chemical Analysis

MATH 209/219* Elements of Applied Probability & Statistics (*Core Skill 3*)MATH 102 College Algebra (*Core Skill 3*)*or* MATH 103 Trigonometry*or* MATH 120 Pre-Calculus Mathematics (*Core Skill 3*)*or any MATH course above 210***4. Electives:***(9 hours)**Select at least three courses listed below. At least one course must be taken from each group.***Group I Advanced Economics**

ECON 309 Comparative Economic Systems

ECON 405 Economic Growth and Development: The Developing Economies

Group II Advanced Political Science

POSC 330 Politics of Africa

POSC 331 Politics of Latin America

POSC 332 Politics of the Middle East

POSC 450 Environmental Public Policy

GEOG 407 Political Geography

Group III Advanced Humanities

ENGL 440 Literature of the Environment

HIST 309 World Environmental History

PHIL 315 Philosophy and the Environment

Summary of Requirements for Teaching Certification Option in Biology

If you wish to complete a Maryland State approved program in teaching Biology, you must:

- Complete the BA/BS in Biology (without concentration).
- Meet the phase admissions requirements summarized in the Educational Professions section.
- Complete the professional education sequence described in Education: Secondary School Programs.

Interpretive Biology and Natural History

Major

See related programs:

- biology
 - pre-health option
 - biotechnology
 - environmental science
- environmental analysis & planning
- ethnobotany
- forestry
- wildlife & fisheries

Coordinator:

Frank Ammer, Assistant Professor, Department of Biology

Professors:

Harman, Morton, Raesly, Yoder

Associate Professors:

Li, Pegg, Seddon, Serfass

Assistant Professors:

Ammer, Fritz, Ghioca

For Major

Hours Required in Biology: 44-55

Hours Required in Other Departments: 23-30

Total Hours Required: 74-78

Summary of Requirements for Major in Interpretive Biology and Natural History

Major

1. Introductory Level Courses:

(8 hours)

BIOL 149 General Biology I (*GEP Group C*)

BIOL 150 General Biology II

2. Advanced Level Courses

(32-35 hours)

BIOL 230 Wildlife Techniques

BIOL 309 General Entomology

BIOL 314 Plant Taxonomy

BIOL 334 General Animal Behavior

BIOL 340 General Ecology

BIOL 406 Ornithology

BIOL 411 Invertebrate Zoology

BIOL 426 Vertebrate Zoology

BIOL 494 Field Experiences in Biological Sciences (*minimum 3 credits*) (*Capstone*)

3. Electives:

Select 11-12 hours from among the following:

BIOL 305 Dendrology

BIOL 311 Morphology of Fungi and Non-Vascular Plants

BIOL 312 Morphology of Vascular Plants

BIOL 402 Evolution

BIOL 417 Ichthyology

BIOL 422 Herpetology

BIOL 425 Forest Science

BIOL 423 Mammalogy

BIOL 430 Introductory Limnology

GEOG 208 Historical Geology

GEOG 445 Biogeography

4. Required Courses in Other Departments

(23 hours)

CHEM 101 General Chemistry I (*GEP Group C*)

CMST 102/112 Introduction to Human Communication

COSC 100/110 Introduction to Computer Science (*Tech. Fluency*)

GEOG 103/113 Physical Geography (*GEP Group C*)

MATH 209/219 Elements of Applied Probability and Statistics (*Core Skill 3*)

RECR 330 Outdoor Education

RECR 342 Park and Facility Design

5. Suggested (Optional) Courses in Other Departments

ART 235 Photography

CMST 322 Presentational Communication

ENGL 336 Journalistic Writing

PHSC 210 Descriptive Astronomy

PHSC 211 Descriptive Astronomy Laboratory

RECR 201 Introduction to Recreation and Parks

Chemistry

	Trad. Track	For Major Profess. Con.	Biochem. Con.	Teaching Certification	For Minor
Hours Required in Chemistry:	38	48	40	41	25
Hours Required in Other Departments:	20	20	31	66.5	0
Total Hours Required:	58	68	71	107.5	25

Major

Minor

Track in:

- traditional chemistry

Concentrations in:

- professional chemistry
- biochemistry

Teaching certification option

Professors:

Larivee (Chair), F. Senese,
Weser

Associate Professors:

Mumper

Assistant Professor:

Biser, Simon

- All chemistry majors must take the core courses and select either the Traditional Track, Professional Concentration, Biochemistry Concentration or Teaching Certification Option to fulfill requirements for the major. The Traditional Track is recommended for students wishing to double major.
- Chemistry is often selected as a major by students planning to enter health professions careers. The Biochemistry Concentration is a suitable choice. (See the section on Health Professions Preparation of this catalog.)
- The Professional Concentration is a strong program for graduate school preparation.

Summary of Requirements for Major/Minor in Chemistry

Major	Minor
<p>1. Core Introductory Level Courses: (8 hours) CHEM 101 General Chemistry I (GEP Group C) CHEM 102 General Chemistry II</p>	<p>(8 hours) CHEM 101 General Chemistry I (GEP Group C) CHEM 102 General Chemistry II</p>
<p>2. Core Advanced Courses: (22 hours) CHEM 300 Computational Tech. in Chem CHEM 301 Organic Chemistry I CHEM 302 Organic Chemistry II CHEM 320 Quantitative Anal. Chem. CHEM 441 Physical Chem. Lecture I CHEM 445 Physical Chemistry Lab I CHEM 491 Seminar in Chemistry CHEM 492 Capstone Experience</p>	<p>(17 hours) CHEM 301 Organic Chemistry I CHEM 302 Organic Chemistry II and 7 additional hours in Chemistry, 300 level or above, except CHEM 491 Seminar in Chemistry, CHEM 492 Capstone Experience, CHEM 493 Advanced Chemical Research, CHEM 495 Internship in Chemistry, and CHEM 499 Special Problems in Chemistry</p>
<p>3. Required Courses in Other Departments: Mathematics: (8 hours) MATH 236 Calculus I (Core Skill 3) MATH 237 Calculus II Physics: (8 hours) PHYS 215, 216 General Physics I, II (215: GEP Group C) or PHYS 261, 262 Principles of Physics I, II (261: GEP Group C)</p>	
<p>4. Choice of Specialization: (12 - 61.5 hours) Majors must choose the Traditional Track, Professional Concentration, Biochemistry Concentration or Teaching Certification Option. Requirements listed below.</p>	
<p>5. All majors must earn a C or better in CHEM 101, 102, 301, 302, 320.</p>	

Requirements for the Traditional Track for Chemistry Majors

- Core Courses:**
(46 hours)
Required of all Chemistry majors, listed above
- Advanced Courses:**
(8 hours)
CHEM 421 Instrumental Analysis
CHEM 442 Physical Chemistry II
CHEM 446 Physical Chemistry Lab II
- Required Courses in Mathematics:**
(4 hours)
MATH 238 Calculus III
- All majors in this track must earn a C or better in CHEM 441.**

Requirements for the Professional Concentration for Chemistry Majors

- Core Courses:**
(46 hours)
Required of all Chemistry majors, listed above.
- Additional Core Courses:**
(12 hours)
CHEM 411 Advanced Inorganic Chemistry
CHEM 421 Instrumental Analysis
CHEM 442 Physical Chemistry II
CHEM 446 Physical Chemistry Lab II
- Advanced Courses**
(6-7 hours)
CHEM 455 Biochemistry I
CHEM 493 Advanced Chemistry Research (1-3 hours)
If less than three hours of CHEM 493 are taken, then one additional advanced course from among the following is required:
CHEM 438 Advanced Organic Chemistry
CHEM 457 Biochemistry II
CHEM 460 Environmental Chemistry
CHEM 490 Selected Topics in Chemistry
- Required Courses in Other Departments**
Mathematics: (4 hours)
MATH 238 Calculus III
- All majors in this concentration must earn a C or better in CHEM 441.**

Requirements for the Biochemistry Concentration for Chemistry Majors

(Pre-Dental, Pre-Medical, Pre-Optometry, Pre-Veterinary, Pre-Pharmacy)

- Core Courses:**
(46 hours)
Required of all Chemistry majors, listed above.
- Advanced Courses:**
(7 hours)
CHEM 455 Biochemistry I
CHEM 456 Biochemistry Lab
CHEM 457 Biochemistry II
- Required Courses in Biology:**
(15 hours)
BIOL 149 General Biology I (GEP Group C)
BIOL 304 Microbiology
BIOL 350 Genetics
BIOL 435 Molecular Biology
- Required Electives:**
(3-4 hours)
Select from among:
CHEM 411 Advanced Inorganic Chemistry
CHEM 420 Environmental Chemical Analysis
CHEM 421 Instrumental Analysis
CHEM 442 Physical Chemistry II
CHEM 493 Advanced Chemistry Research (3 hours minimum)
MATH 238 Calculus III
- All majors in this concentration must earn a C or better in CHEM 455.**

Requirements for the Teaching Certification Option in Chemistry

- Core Courses:**
(46 hours)
Required of all Chemistry majors, listed above.
- Advanced Courses:**
(11 hours)
CHEM 442 Physical Chemistry II
CHEM 446 Physical Chemistry Lab II
CHEM 455 Biochemistry I
CHEM 460 Environmental Chemistry
CHEM 493 Advanced Chemistry Research (1 hour)
- Required Courses in Other Departments**
(8 hours)
MATH 238 Calculus III
BIOL 149 General Biology (GEP Group C)
- Required Courses in Education**
(42.5 hours)
See Professional Education sequence for Secondary Programs in the Educational Professions section of this catalog.

Communication Studies

	For Major	For Minor
Hours Required in Communication Studies:	21-33	21
Hours Required in Other Departments:	6-18	3
Total Hours Required:	39	24

Major

Minor

Professors:

Routhier, M. Wallinger

Assistant Professor:

Ruminski

Lecturer:

R. Wallinger

- Only courses in which you earn a grade of C or better may count towards satisfaction of major or minor requirements.
- All grades earned in courses completed for the major in Communication Studies count in determining whether you meet the graduation requirement of a 2.0 cumulative grade point average in the major.

Summary of Requirements for Major/Minor In Communication Studies

Major	Minor
<p>1. Communication Studies Core Courses: (18 hours) <i>All of the following:</i> CMST 102/112 Intro. to Human Comm. CMST 300 Interpersonal Communication CMST 302 Argumentation & Advocacy CMST 312 Language Behavior & Comm. CMST 485 Issues & Responsibilities of Comm. <i>and one from:</i> CMST 422 Seminar in Comm. Analysis CMST 451 Seminar in Communication Theory</p> <p>2. Communication Studies Tracks: (12 hours) <i>Select one of the following tracks:</i></p> <p>a. Professional Communication CMST 215 Small Group Communication CMST 225 Interviewing CMST 322 Presentational Communication CMST 335 Organizational Communication</p> <p>b. Interdisciplinary Track Select an additional four courses to create a definable Communication Studies Track. <i>This option requires the collaboration and written approval of your faculty advisor.</i> You may select courses in art and design, business administration, communication studies, computer science, English, mass communication, philosophy, political science, psychology, and sociology.</p> <p>3. Practicum: (3 hours) You are required to participate in a three-credit Practicum. This requirement may be met by completing three credits of CMST 494 Communication Studies Practicum, or by completing the graded academic portion of the internship course CMST 492 Internship Project. (<i>Capstone</i>)</p> <p>4. Required Courses in Other Departments: (6 hours) COSC 100 Introduction to Computer Science (<i>Tech. Fluency</i>) MCOM 105 Intro. to Mass Communication</p>	<p>(21 hours) <i>All of the following:</i> CMST 102/112 Intro. to Human Communication CMST 485 Issues & Responsibilities of Communication <i>and one from:</i> CMST 300 Interpersonal Communication CMST 302 Argumentation and Advocacy CMST 312 Language Behavior & Comm. <i>and one from:</i> CMST 422 Seminar in Comm. Analysis CMST 451 Seminar in Communication Theory <i>and three additional courses from:</i> CMST 215 Small Group Communication CMST 225 Interviewing CMST 300 Interpersonal Communication CMST 302 Argumentation and Advocacy CMST 312 Language Behavior & Comm. CMST 322 Presentational Communication CMST 335 Organizational Communication CMST 422 Seminar in Comm. Analysis CMST 451 Seminar in Communication Theory</p> <p>2. Required Courses in Other Departments: (3 hours) MCOM 105 Intro. to Mass Communication</p>

Computer Print Graphics

For Certificate

Hours Required in Art:	24
Hours Required in Other Departments:	0
Total Hours Required:	24

Certificate

Professors:

Brown, Davis, Dieruf,
Llewellyn

Associate Professor:

Rhodes (chair)

Assistant Professor:

Herzfeld, Hodges

- The certificate in Computer Print Graphics is offered by the Department of Visual Arts. The department also offers a B.F.A. in Art and Design and minors in art history, fine arts, and graphic design.
- You should consider this certificate if you are a degree-seeking student in another major who would like to acquire additional skills to enhance your professional marketability or a community member seeking professional education in the technology sector.
- Classes are scheduled so you can complete the certificate in four semesters.

The certificate in Computer Print Graphics is designed to assist you to:

- Understand the role a computer plays in a graphic designer's career
- Learn the basic functions of the Macintosh computer
- Gain fundamental knowledge of graphic applications like QuarkXpress, Adobe Illustrator, Adobe Photoshop
- Learn reproduction and manipulation of scanned images
- Create comprehensive layouts
- Develop a personal design style and vocabulary based on knowledge of past and contemporary design trends, materials, and commercial printing techniques.

Students may transfer a maximum of 12 credits into the program selected from ART 104, ART 105, ART 207, ART 212, and ART 412.

Summary of Requirements for Certificate in Computer Print Graphics

Certificate

1. Required Courses:

(24 hours)

ART 104 Two-dimensional Design
 ART 105 Three-dimensional Design
 ART 207 Graphic Design
 ART 212 Drawing
 ART 307 Computer Graphics
 ART 407 Advanced Graphic Design - Print (Level I)
 ART 407 Advanced Graphic Design - Print (Level II)
 ART 412 Advanced Drawing

College-level proficiency in English is required, as evidenced by a passing score on the English placement exam, completion of ENGL 101 or completion of its equivalent at another institution.

Computer Science

	For Major	For Info. Systems Concentration	For Networks Concentration	For Minor
Hours Required in Computer Science:	46	46	52	20
Hours Required in Other Departments:	20	18-19	13	0
Total Hours Required:	66	64-65	65	20

Major

Minor

Concentrations in

- information systems
- networks

Certificates in

- computing technology
- software development
- programming
- networking

Professors:

Chitsaz, Rinard (Chair),
Tracy

Associate Professor:

Thiel

Assistant Professor:

Crall, Liu

- Computer Science courses must have a grade of C or better to be applied towards major or minor requirements.
- You will be de-registered from any computer science course for which you have not earned a C or better in the prerequisite computer science course(s).
- You may receive credit by examination for the following courses: COSC 100, 240, 350.
- The Department of Computer Science also offers four certificates to students in other majors and community members. (See separate section).

Summary of Requirements for Major/Minor in Computer Science

Major	Minor
<p>1. Core Courses: (22 hours)</p> <p>COSC 101 The Discipline of Computer Science COSC 240 Computer Science I COSC 241 Computer Science II COSC 325 Software Engineering COSC 365 Digital Logic & Computer Design COSC 460 Operating Systems Concepts COSC 489 Computer Science Capstone</p>	<p>(11 hours)</p> <p>COSC 101 The Discipline of Computer Science COSC 240 Computer Science I COSC 241 Computer Science II</p>
<p>2. Required Advanced Courses: (15 hours)</p> <p>COSC 310 Data Structures & File Organization COSC 331 Fundamentals of Computer Networks COSC 350 Computer Org. & Assembly Language COSC 450 Programming Language Structures COSC 470 Compiler Designs and Constructions</p>	
<p>3. Other Required Courses:</p> <p>Mathematics (14 hours) MATH 236, 237 Calculus I, II (MATH 236 - Core Skill 3) MATH 350 Linear Algebra I or MATH 432 Differential Equations or MATH 435 Numerical Analysis or MATH 437 Combinatorics and Graph Theory or MATH 470 Mathematical Models and Applications MATH 380 Introduction to Probability & Statistics</p> <p>Other (6 hours) CMST 102 Introduction to Human Communication ENGL 338 Technical Writing (Core Skill 2)</p>	
<p>4. Electives: (9 hours)</p> <p>Three additional computer science courses from:</p> <p>COSC 305 Computer Ethics COSC 335 Network Architecture Design COSC 345 The Internet and Multimedia Communications COSC 390 Topics in Modern Programming Languages COSC 415 Computer Interfacing COSC 420 Robotics and Industrial Computer Applications COSC 431 Secure Computing COSC 435 Network Implementation and Testing COSC 440 Database Management Systems COSC 444 Introduction to Distributed Programming COSC 445 Network and Distributed System Management COSC 455 Artificial Intelligence COSC 465 Computer Systems Architecture COSC 475 Interactive Computer Graphics COSC 485 Theory of Computation COSC 491 Seminar in Computer Science COSC 494 Field Exp. in Computer/Information Science COSC 499 Individual Problems in Computer Science</p>	<p>(9 hours)</p> <p>Three additional computer science courses. Two must be at the 300-level or above.</p>

Requirements for Major Concentrating in Information Systems

1. Core Courses:

(22 hours)

COSC 101 The Discipline of Computer Science
COSC 240 Computer Science I
COSC 241 Computer Science II
COSC 325 Software Engineering
COSC 365 Digital Logic & Computer Design
COSC 460 Operating Systems Concepts
COSC 489 Computer Science Capstone

2. Required Advanced Courses:

(15 hours)

COSC 300 Structured System Analysis and Design
COSC 335 Network Architecture Design
COSC 380 Computer-Based Information Systems
COSC 440 Database Management Systems
COSC 480 Knowledge-Based Systems

3. Other Required Courses:

Mathematics (6-7 hours)

MATH 220 Calculus for Applications

or MATH 236 Calculus I (Core Skill 3)

MATH 209/219 Elements of Applied Probability & Statistics (Core Skill 3)

or MATH 380 Intro. to Probability & Statistics

Other (9 hours)

ACCT 211 Financial Accounting

CMST 102 Introduction to Human Communication

ENGL 338 Technical Writing (Core Skill 2)

4. Electives:

(9 hours)

Three additional computer science courses from:

COSC 305 Computer Ethics

COSC 320 Business Programming

COSC 331 Fundamentals of Computer Networks

COSC 345 The Internet and Multimedia Communications

COSC 350 Computer Organization and Assembly Language

COSC 390 Topics in Modern Programming Languages

COSC 431 Secure Computing

COSC 491 Seminar in Computer Science

COSC 494 Field Experience in Computer/Information Science

COSC 499 Individual Problems in Computer Science

5. Elective in Business

(3 hours)

Any 300- or 400-level course in Business Administration (BUAD, FINA, MGMT, MKTG)

Requirements for Major Concentrating in Networks

1. Core Courses:

(22 hours)

COSC 101 The Discipline of Computer Science
COSC 240 Computer Science I
COSC 241 Computer Science II
COSC 325 Software Engineering
COSC 365 Digital Logic & Computer Design
COSC 460 Operating Systems Concepts
COSC 489 Computer Science Capstone

2. Required Advanced Courses:

(18 hours)

COSC 331 Fundamentals of Computer Networks
COSC 335 Network Architecture Design
COSC 345 The Internet and Multimedia Communications
COSC 431 Secure Computing
COSC 435 Network Implementation and Testing
COSC 444 Introduction to Distributed Programming

3. Other Required Courses:

Mathematics (7 hours)

MATH 209/219 Elements of Applied Probability & Statistics (*Core Skill 3*)
or MATH 380 Introduction to Probability & Statistics
MATH 236 Calculus I (*Core Skill 3*)

Other:

(6 hours)

CMST 102 Introduction to Human Communication
ENGL 338 Technical Writing (*Core Skill 2*)

4. Electives:

(12 hours)

Four additional computer science courses from:

COSC 305 Computer Ethics
COSC 310 Data Structures and File Organization
COSC 350 Computer Organization and Assembly Language
COSC 390 Topics in Modern Programming Languages
COSC 445 Network and Distributed System Management
COSC 450 Programming Language Structures
COSC 455 Artificial Intelligence
COSC 465 Computer Systems Architecture
COSC 485 Theory of Computation
COSC 491 Seminar in Computer Science
COSC 494 Field Experience in Computer/Information Science
COSC 499 Individual Problems in Computer Science

Certificates in

- computing technology
- software development
- programming
- networking

The four **computer science certificates** offer learning opportunities to a range of students, from computing novices to computing professionals. Interested students might include:

- Degree-seeking undergraduates in any major who wish to develop computing skills beyond those required in their degree program. The certificate represents a credential that may enhance career opportunities in any field.
- Non-degree-seeking students who wish to develop computing and technical skills to increase opportunities for employment.
- Bachelor's degree holders and professionals in the field looking for career enhancement or change.
- If you are completing the networks concentration in the computer science major you cannot earn the networking certificate.

Computing Technology

- A course of study for a learner with little or no computing experience looking to develop a solid skill set in computing basics.

(12 hours)

COSC 100/110 Introduction to Computer Science (*You may test out of COSC 100/110*) (Tech. Fluency)

COSC 120 Introduction to Cyberspace

COSC 130 Introduction to Programming

COSC 220 Introduction to Software Applications

Software Development

- A study of programming fundamentals and software development methods for a student with basic computing skills.

(14 hours)

COSC 101 The Discipline of Computer Science

COSC 240 Computer Science I

COSC 241 Computer Science II

COSC 325 Software Engineering

Programming

- A study sequence for students with basic computing skills that provides a foundation in computer programming fundamentals and working expertise in an object-oriented programming language.

(14 hours)

COSC 101 The Discipline of Computer Science

COSC 240 Computer Science I

COSC 241 Computer Science II

And one of the following:

COSC 310 Data Structures & File Organization

COSC 390 Topics in Modern Programming Languages

Networking

- A study sequence for students with programming experience wishing to develop expertise in network theory, design, and application. Permission of department chair required.

(17 hours)

COSC 241 Computer Science II (*COSC 240 is prerequisite for COSC 241. Students may test out of COSC 240*)

COSC 335 Network Architecture and Design

COSC 365 Digital Logic and Computer Design

COSC 435 Network Implementation and Testing

COSC 445 Network and Distributed System Management

Criminal Justice

	For Major
Hours required at the community college partner	62-70
Hours required at Frostburg State University	50-58
Total Hours Required	120

Collaborative Program

Major

Coordinator:

David Lewis, Associate Professor, Department of Political Science

Coordinating Committee:

Professors:

T. Mappes (Philosophy)

Associate Professors:

Johnson, Lewis (Political Science), Olson (Sociology)

Assistant Professor:

McMullen (Sociology)

- If you do not have a criminal justice degree from a community college, you are not eligible for this major. Students who do not hold an AAS in criminal justice should see the Law and Society major with concentrations in criminal justice and legal studies for additional paths to careers in law and law enforcement.
- If you complete the major in criminal justice, you will earn the Bachelor of Technical and Professional Studies (BTPS) degree.
- Since criminal justice is an interdisciplinary program, grades in all program courses completed at FSU count in the major grade point average.
- Six to nine credits of field experience or internship are required.
- This program is offered at the Frostburg campus and at the University System of Maryland at Hagerstown.

The Bachelor of Technical and Professional Studies degree in criminal justice is a collaborative program between Frostburg State University and Allegany College of Maryland, Hagerstown Community College and Frederick Community College. The program is designed to provide advanced career opportunities for students who hold an Associate of Applied Science degree in criminal justice from ACM, HCC or FCC, or an A.A. degree in criminal justice from FCC. If you hold a similar degree from another program, you may be considered for admission based on an articulation agreement between FSU and the other undergraduate institution.

Students who do not hold an AAS in criminal justice should see the Law and Society major with concentrations in criminal justice and legal studies

The program is designed to prepare students for advancement in careers in law enforcement, corrections, and probation and parole. Building on the technical skills gained in the associate degree program, and on experience in the field, the baccalaureate program will enhance your understanding of societal issues, political processes, and administrative structures that impact the criminal justice system, and provide opportunities to hone your research and management skills.

Summary of Requirements for a Major in Criminal Justice

1. **An Associate of Applied Science in Criminal Justice degree** from Allegany College of Maryland, or an Associate of Applied Science in Administration of Justice from Hagerstown Community College or an Associate's or Associate of Applied Science degree in Criminal Justice from Frederick Community College. A maximum of 70 credits will transfer from all community colleges you have attended.

2. **General Education Requirements:**

You must complete a minimum of 40 credits in general education as part of the baccalaureate program, including an advanced writing course that must be completed at FSU.

3. **Program Core Courses at:**

A. Allegany College of Maryland

(39 hours)

Criminal Justice 101 Introduction to Criminal Justice
 Criminal Justice 102 Police Administration and Organization
 Criminal Justice 103 Criminal Law
 Criminal Justice 104 Criminal Evidence and Procedure
 Criminal Justice 105 Criminal Investigation
 Criminal Justice 106 Introduction to Corrections
 Criminal Justice 108 American Courts and Legal System
 Criminal Justice 201 Criminalistics
 Political Science 101 American National Government
 Political Science/Criminal Justice 205 American Constitutional Law
 Psychology 101 General Psychology
 Psychology 202 Human Adjustment *or* Psychology 205 Abnormal Psychology
 Sociology 101 Introduction to Sociology

B. Hagerstown Community College

(27 hours)

ADJ 101 Intro to Criminal Justice
 ADJ 201 Law Enforcement/Community
 ADJ 204 Criminal Investigation
 ADJ 208 Police Management
 ADJ 209 Corrections Management
 POL 101 American Government
 POL 202 Constitutional Law
 PSY 201 General Psychology
 SOC 103 Criminology

C. Frederick Community College*(27 hours)*

CJ 101 Intro to Criminal Justice
 CJ 110 Criminal Law
 CJ 204 Police Operational Services
 CJ 214 The Correctional Process
 CJ 220 Criminal Evidence and Procedure
 CM or CMSP 103 Speech Fundamentals
 PI 104 American Government National
 PS 101 Intro to Psychology
 SO 201 Criminology

4. Frostburg Campus:**A. Program Core Courses:***(34 hours)*

POSC 311 Research Methods *or* SOCI 311 Basic Research Methods
 POSC 321 State and Local Politics
 POSC 323 Public Administration
 POSC 423 American Constitutional Law II
 POSC 489 Law & Society Capstone *(1 credit)*
 POSC 492 Internship Seminar *(3 credits)*
 POSC 495 Internship in Political Science *(6 credits)*
 SOCI 200 Social Problems *or* SOCI 203 Deviant Behavior
 SOCI 305 Racial and Cultural Minorities *(GEP Group F)*
 SOCI 340 Criminology
 SOCI 442 Juvenile Delinquency

B. Program Elective Courses:*(6 hours)**Select from:*

MGMT 351 Management of Organizations
 MGMT 356 Leadership and Interpersonal Skills*
 MGMT 357 Human Resources Management*
 PSYC 386 Drugs and Human Behavior
 PHIL 304 Social Philosophy
 PHIL 410 Philosophy of Law

5. USM at Hagerstown:**A. Program Core Courses:***(28-31 hours)*

CRJU 490 Advanced Topics in Criminal Justice (6 hours)
 CRJU 494 Field Experience (6-9 hours)
 ENGL 338 Technical Writing *or* ENGL 330 Business Writing
 POSC 323 Public Administration
 POSC 423 Constitutional Law II
 POSC 489 Law & Society Capstone *(1 credit)*
 SOCI 311 Basic Research Methods
 SOCI 442 Juvenile Delinquency

B. Program Elective Courses:*(6 hours)**Select from:*

MGMT 351 Management of Organizations
 MGMT 356 Leadership and Human Behavior*
 MGMT 357 Human Resource Management*
 POSC 321 State and Local Politics
 POSC 358 American Public Policy
 POSC 422 American Constitutional Law I

**Requires MGMT 351 as prerequisite*

Cultural Anthropology

Minor

Coordinator:

Kara Rogers-Thomas,
Assistant Professor,
Department of Sociology

- You cannot major in Cultural Anthropology.

For minor:

Hours Required in Sociology:	9-12
Hours Required in Other Departments:	6-9
Total Hours Required:	18

Summary of Requirements for Minor in Cultural Anthropology

Minor

1. Basic Courses:

(9 hours)

SOCI 100/111 Intro to Sociology (*GEP Group D*)
SOCI 224 Cultural Anthropology (*GEP Group F*)
SOCI 362 Sociology of Religion

2. Distribution of Electives:

(9 hours)

At least 6 of which must be in two different disciplines other than Sociology.

AAST 300/HIST 301 Traditional Africa
AAST 400 Africans of the Diaspora
ART 302 Artistic Traditions: Africa and the Americas
BIOL 128 Introduction to Ethnobotany
BIOL 484 Field Experiences in Ethnobotany and Ecology
ENGL 280 Mythology and Literature
GEOG 104/114 Human Geography (*GEP Group D*)
GEOG 110 World Regional Geography
GEOG 320 Geography of Latin America
or GEOG 403 The Geography of Sub-Saharan Africa
HIST 318 Native Peoples of the Americas
INST 100 Introduction to International Studies
INST 150 Introduction to World Religions
MUSC 117 Music of Africa, Asia, and the Americas
SOCI 350 Folklore in Appalachia
SOCI 334 Gender and Social Life
SOCI 306 The Sociology of African Americans
SPAN 406 Literature and Culture of the Andean Region

Dance

For Minor

Hours Required in Dance: 23

Hours Required in Other Departments: 2-3

Total Hours Required: 25-26

Minor

Coordinator:See Co-Chair, Division of
Performing Arts**Associate Professor:**

Fischer

- You are required to participate in either the annual Fall or Spring Dance Concert.
- You may not receive credit for both a DANC course and the same course formerly labelled PHEC.
- You cannot major in Dance.

Summary of Requirements for Minor in Dance

Minor

1. Courses in Dance Technique:*(13 hours)*

DANC 131 Ballet I
 DANC 142 Modern I
 DANC 154 Jazz I
 DANC 231 Ballet II
 DANC 242 Modern II
 DANC 254 Jazz II
 DANC 342 Modern III

2. Courses in Dance Composition and Theory*(10 hours)*

DANC 110 Dance Appreciation (*GEP Group A*)
 DANC 408 Choreography & Production
 DANC 429 Special Topics in Dance (*4 credits required*)

3. Required Courses in Other Departments*(2-3 hours from among)*

MUSC 101 Music Fundamentals
 THEA 104 Theatre
 THEA 107 Intro. to Theatrical Vision (*GEP Group A*)
 ART 104 Foundational Studies I

Dental Hygiene Preparation

For Pre-professional Program

Total Hours:

65

Summary of Requirements for Pre-professional Program in Dental Hygiene Preparation

Pre-professional program

Coordinator:

David Morton, Professor,
Department of Biology

- The listed pre-professional courses are required for students interested in attending the University of Maryland, Baltimore's Dental Hygiene Program. These courses could also be taken, together with additional requirements, by students interested in attending other programs in Dental Hygiene.
- It is expected that each student enrolled in the Pre-Dental Hygiene Program will earn and maintain a **minimum 3.0** cumulative grade point average and a 3.0 cumulative grade point average in biology, chemistry, and nutrition to be considered competitive for the program.
- You cannot major or minor in Dental Hygiene Preparation.

1. Biology

(16 hours)

BIOL 149 General Biology I
BIOL 201 Anatomy & Physiology I
BIOL 202 Anatomy & Physiology II
BIOL 304 Microbiology

2. Chemistry

(13 hours)

CHEM 101 General Chemistry I
CHEM 102 General Chemistry II
CHEM 301 Organic Chemistry I

3. English

(9 hours)

ENGL 101/111 Freshman Composition
ENGL 310/312 Advanced Composition
ENGL 338 Technical Writing

4. Communication Studies

(3 hours)

CMST 102 Intro. to Human Communication

5. Sociology

(3 hours)

SOCI 100/111 Intro. to Sociology

6. Math

(3 hours)

MATH 209/219 Elements of Applied Probability & Statistics

7. Health

(3 hours)

HEED 200 Nutrition

8. Psychology

(3 hours)

PSYC 150/151 General Psychology

9. Humanities

(6 hours)

Courses must be selected from two different areas: English (literature), philosophy, mathematics, foreign language, history, and music/art (appreciation or history)

Some suggested courses:

MATH 102, 103
PHIL 102, 313
MUSC 110, 117
ENGL 150/250, 260, 261, 290

10. Social Science

(6 hours)

Courses may be selected from the following areas: psychology, sociology, economics, business administration, geography, political science, and computer science.

Earth Science

	For Major	For Environmental Science Concentration	Teaching Cert. Option
Hours Required in Geography:	28	37	30
Hours Required in Other Fields:	17	34	59.5
Total Hours Required:	45	71	89.5

Major

Concentration in

- environmental science

Teaching Certification Option

Participating Faculty:

Professors:

Yoder (Biology), Caupp,
Precht (Geography)

Associate Professors:

Doyle (Physics), Kessler
(Geography), Pegg
(Biology), Tam (Physics)

Assistant Professors:

David Arnold,
M. Ramspott, D. Welsch
(Geography)

- This is a multidisciplinary program jointly administered by the Departments of Geography, Physics, Biology and Chemistry.
- An optional internship is available in Earth Science.
- You may pursue Earth Science middle/secondary teacher certification. Contact the Chair of the Educational Professions Department.
- There is no minor in Earth Science.

Summary of Requirements for Major in Earth Science

1. Introductory Level Courses:

(7 hours)

GEOG 103 or 113 Physical Geography (GEP Group C)

GEOG 275 Fundamentals of Geographic Data Handling (Tech. Fluency)

2. Required Advanced Courses:

(26-27 hours)

GEOG 207 Physical Geology

GEOG 208 Historical Geology

GEOG 310 Fundamentals of Cartography

GEOG 335 (or SCIE 335) Oceanography

or GEOG 340 Soil: Genesis, Nature and Characterization*

GEOG 380 Research Methods in Geography

GEOG 430 Surface Water Hydrology

or GEOG 431 Glacial and Pleistocene Geomorphology*

GEOG 486 Earth Science Capstone

MATH 209 Elements of Applied Probability and Statistics (Core Skill 3)

PHSC 205 Descriptive Meteorology or GEOG 405 Climatology*

3. Required Supporting Science Sequence:

(8 hours)

Complete one of the supporting Science Sequences:

BIOL 149-150 General Biology (BIOL 149 - GEP Group C)

CHEM 101-102 General Chemistry (CHEM 101 - GEP Group C)

PHYS 215-216 General Physics I and II (PHYS 215 - GEP Group C)

PHYS 261-262 Principles of Physics I and II (PHYS 261 - GEP Group C)

4. Elective:

(3-6 hours)

Select at least one of the following courses (two for teaching certification)**

BIOL 305 Dendrology

BIOL 314 Plant Taxonomy

BIOL 340 Ecology

BIOL 411 Invertebrate Zoology

BIOL 426 Vertebrate Zoology

GEOG 406 Management and Conservation of Natural Resources

GEOG 413 Remote Sensing—Aerial Photo Interpretation

GEOG 432 Groundwater Hydrology

GEOG 441 Soil Analysis

GEOG 445 Biogeography

GEOG 460 Natural Hazards in the Physical Environment

PHSC 210 Descriptive Astronomy

PHSC 220 The Solar System

*Courses not selected to meet requirements, may be used as electives.

**Some of these courses may require additional prerequisite course work.

Summary of Requirements for Teaching Certification Option in Earth Science

If you wish to complete a Maryland State approved program in teaching Earth Science, you must:

- Complete the BA/BS in Earth Science (without a concentration).
- Meet the phase admissions requirements summarized in the Educational Professions section.
- Complete the professional education sequence described in Education: Secondary School Programs.
- Select the following courses to complete your major: PHSC 205, PHSC 210 or PHSC 220, GEOG/SCIE 335, and GEOG 406 or GEOG 460.

- The Environmental Science concentration is dedicated to the study of the relationships between humans and their environments.
- You will become sensitive, articulate, and knowledgeable about increasingly complex environmental issues facing contemporary society.
- Course work in this concentration will provide the theoretical and practical background as well as the skills necessary to study environmental science from a wide range of perspectives.
- You must meet certain criteria and deadlines prior to enrollment in either GEOG 488 or GEOG 492.
- You must select 2 other members for your advisory committee in addition to your advisor from the faculty in participating departments. At least 1 member of the committee must be from Geography.

Summary of Requirements for Environmental Science Concentration in Earth Science

1. Introductory Level Courses:

(16 hours)

- GEOG 103 or GEOG 113 Physical Geography (GEP Group C)
 GEOG 104 Human Geography (GEP Group D or F)
 or GEOG 110 World Regional Geography: Cultural Diversity (GEP Group F)
 GEOG 275 Fundamentals of Geographic Data Handling (Tech. Fluency)
 MATH 102 College Algebra (Core Skill 3)
 MATH 209 Elements of Probability and Statistics (Core Skill 3)

2. Required Advanced Courses:

(15 hours)

- GEOG 380 Research Methods in Geography
 GEOG 406 Management and Conservation of Natural Resources
 GEOG 445 Biogeography
 GEOG 472 Environmental Planning or GEOG 473 Environmental Law
 GEOG 486 Earth Science Capstone
 GEOG 488 Environmental Practicum or GEOG 492 Internship: Research in Geography*
 *requires co-registration in GEOG 495

3. Required Supporting Science Sequence:

(16 hours)

- BIOL 149 General Biology I (GEP Group C)
 BIOL 150 General Biology II
 CHEM 101 General Chemistry I (GEP Group C)
 CHEM 102 General Chemistry II

4. Electives:

(24-25 hours)

Select two courses in each group:**

Group I Advanced Biology

- BIOL 314 Plant Taxonomy or BIOL 305 Dendrology
 BIOL 340 General Ecology
 BIOL 406 Ornithology
 BIOL 421 Sample Design and Analysis of Plant Communities
 BIOL 422 Herpetology
 BIOL 423 Mammalogy
 BIOL 430 Introductory Limnology

Group II Advanced Techniques

- GEOG 310 Fundamentals of Cartography
 GEOG 317 Principles of Geographic Information Science
 GEOG 413 Remote Sensing - Aerial Photo Interpretation
 GEOG 414 Digital Image Processing and Analysis
 GEOG 433 Surveying and Field Techniques

GROUP III Advanced Physical Geography

- GEOG 335 Oceanography
 GEOG 340 Soil: Genesis, Nature and Characterization
 GEOG 405 Climatology
 GEOG 430 Surface Water Hydrology
 GEOG 431 Glacial & Pleistocene Geomorphology
 GEOG 432 Groundwater Hydrology
 GEOG 460 Natural Hazards in the Physical Environment

GROUP IV Advanced Human Systems

Take two of the following from two different disciplines:

- ECON 410 Resource and Environmental Economics
 ENGL 440 Literature of the Environment
 GEOG 300 Economic Geography
 GEOG 407 Political Geography
 GEOG 410 Locational Analysis
 HIST 309 World Environmental History
 PHIL 315 Philosophy and the Environment
 POSC 450 Environmental Public Policy

**some of these courses may require additional prerequisite course work.

Engineering

Total Hours Required at Frostburg State University:

72-82

Dual-degree Program

Coordinator:

Oguz Soysal, Chair,
Department of Physics and
Engineering

- A dual degree program of Frostburg State University and the University of Maryland, College Park's College of Engineering is available to the student who seeks a career in one of several engineering fields and who also wants a general undergraduate education.
- This program allows you to earn undergraduate degrees from both institutions over a five-year period.
- In this program you attend FSU for approximately three academic years and the University of Maryland, College Park's College of Engineering for approximately two academic years. After completing the academic requirements of FSU — usually at the end of the fourth year (the first year at the University of Maryland, College Park) — you will receive a bachelor's degree from Frostburg State University. Upon meeting all requirements in the Clark School of Engineering, you earn one of several baccalaureate engineering degrees from the University of Maryland, College Park, majoring in any of the following areas:
 - Aerospace Engineering
 - Biological Resources Engineering
 - Chemical Engineering
 - Civil Engineering
 - Computer Engineering
 - Electrical Engineering
 - Engineering Materials
 - Fire Protection
 - Materials Engineering
 - Mechanical Engineering
 - Nuclear Engineering

Summary of Requirements at FSU for Dual Degree in Engineering

1. Chemistry:

(8-18 hours)

CHEM 101 & 102 General Chemistry I & II (CHEM 101 - GEP Group C)

*CHEM 301 & 302 Organic Chemistry I & II

*Organic chemistry courses required for students in chemical engineering.

2. Computer Science:

(4 hours)

COSC 240 Computer Science I

or ENEE 114 Programming Concepts for Engineers

3. Mathematics:

(18 hours)

MATH 236, 237, 238 Calculus I, II & III (MATH 236 - Core Skill 3)

MATH 420 Advanced Calculus, or MATH 436 Mathematical Physics

MATH 432 Differential Equations

4. Engineering:

(3 hours)

ENES 100 Intro to Engineering Design

5. Physics:

(39 hours)

PHYS 261 Principles of Physics I (GEP Group C)

PHYS 262 Principles of Physics II

PHYS 263 Principles of Physics III

PHYS 264 Principles of Physics IV

PHYS 310 Classical Mechanics

PHYS 312 Electricity & Magnetism

PHYS 320 Experimental Physics

PHYS 491 Seminar

PHYS 492 Senior Research & Seminar (Capstone)

Choose one track:

(9 hours)

a. Traditional Physics

PHYS 311 Thermodynamics

PHYS 417 Quantum Physics

plus one 300-400 level physics elective

b. Engineering Physics

With permission of the Department Chair, as many as 6 credits of mechanical or electrical engineering courses at the 200 level or above may be applied.

Courses listed in the study program not to be applied toward the student's major field of study may be applied toward satisfaction of the General Education Program requirements where appropriate.

Dual Degree Requirements at FSU

1. Completion of required courses in the dual degree study program (listed above), 72-82 semester hours depending on field of engineering.
2. Completion of a minimum of 90 semester hours.
3. Completion of FSU's Core Skill Requirements and Modes of Inquiry in the General Education Program (a waiver of Group E courses, requiring a total of at least 23 credit hours in the Liberal Arts Component). Students must complete at least six of the additional nine credits of General Education course work required by the University of Maryland, College Park (Advance Studies CORE requirement) to satisfy the General Education requirements at Frostburg State University.
4. Completion of a major program as approved by the respective Frostburg State Department Chair.
5. Recommendation from the designated official at Frostburg State University (Coordinator of the Dual Degree Program in Engineering).

Requirements for Admission to University of Maryland, College Park

To become a Dual Degree candidate at the University of Maryland, College Park, a student must have satisfied all specified requirements at Frostburg State University. Additionally, the student must have the following:

1. A minimum cumulative 3.0 grade point average at Frostburg;
2. Recommendation from the designated official at Frostburg (Coordinator of the Dual Degree Program in Engineering).

Admission to the College of Engineering of the University of Maryland, College Park is guaranteed to the Frostburg State University Dual Degree student provided the above stated requirements have been satisfied.

Engineering

For all engineering majors

Minimum GEP Hours Required

43

Collaborative Programs

General Education Program

for Electrical & Mechanical Engineering Majors

●The electrical and mechanical engineering programs, offered by Frostburg State University in collaboration with the Clark School of Engineering, University of Maryland, College Park, are accredited by the Accreditation Board for Engineering and Technology (ABET).

●The degree awarded to students completing the program is a B.S. from UM,CP. Therefore, students enrolled in the engineering programs must complete UM,CP's general education program requirements.

●UM,CP requires completion of one Human Cultural Diversity course, focusing on one or more of the following: a) the history, status, treatment, or accomplishment of women or minority groups and subcultures; b) non-Western culture; c) concepts and implications of diversity. If you complete either MUSC 110, MUSC 117 or DANC 110 under Distributive Studies, these courses would also fulfill your diversity requirement. In addition, there are a number of 300-400 level courses that can be taken to fulfill both the Advanced Studies and Diversity requirement. Please consult with your advisor for a listing of approved courses.

●To be granted advanced placement credit for a course, you must meet UM,CP's minimum requirements. These differ from FSU's standards, with a higher score required by UM,CP in a number of areas. Please consult the Engineering Coordinator to verify AP scores required to receive credit.

●Advanced Studies courses should be taken only after completing 56 credits/entering junior standing.

Summary of Fundamental Studies Requirements

1. English

(6 hours)

ENGL 101/111 Freshman Composition-*must be attempted within first 30 credits & passed within first 60*

ENGL 338 Technical Writing or ENGL 339 Scientific Writing - *must be taken after you have completed 56 credits/junior standing*

2. Mathematics

(3-4 hours)

Any MATH 100 or 200 level course except MATH 206, MATH 207, MATH 103 and MATH 104. *Must be attempted by 30 credits, completed by 60-credit level.*

MATH 236 Calculus I, *required under the engineering major, fulfills this requirement.*

Summary of Distributive Studies Requirements

1. Arts and Humanities

(9 hours)

ENGL 150/250 Introduction to Literature

and one History/Theory of the Arts course from the following:

ART 100/111 Art Appreciation or ART 110 Visual Imagery

MUSIC 110 Intro. to World Music or MUSC 117 Music of Africa, Asia and the Americas

THEA 106 Intro. to Theatre

DANC 110 Dance Appreciation

One additional Arts and Humanities course from the above History/Theory of the Arts list or any philosophy course.

2. Mathematics and Natural Sciences

(10 hours)

The mathematics and sciences requirements are fulfilled by courses completed for the engineering program.

3. Social Sciences

(9 hours)

HIST 100/111 The Contemporary World in Historical Perspective

and two behavioral and social science courses from the following:

POSC 110/112 Introduction to American Politics

POSC 113/114 Introduction to World Politics

ECON 200 Basic Economics or ECON 201/211 Princ. of Econ.

GEOG 104/114 Human Geography

PSYC 150/151 General Psychology

SOCI 100/111 Introduction to Sociology

Summary of Advanced Studies Requirements

Two courses (6 credits) required:

Must be 300-400 level courses taken after 56 credits. Students may substitute an approved senior capstone course in their major taken after 86 credits for one of the two required Advanced Studies courses. The other course **must** be outside the major. The following may not be used to fulfill Advanced Studies requirements:

- Professional Writing courses
- Courses used to meet Distributive Studies requirements
- Internships or other experiential learning types of courses
- Courses taken on a pass/fail basis

One independent studies course (*minimum of three credits, outside the major*) may be used toward Advanced Studies requirements as long as it is consistent with the rules above and approved by the Engineering Coordinator.

Electrical Engineering

Collaborative Program

Major

Coordinator:

Julie Yi-Zun Wang, Assistant Professor, Department of Physics and Engineering

- A collaborative program between FSU and the University of Maryland, College Park, which allows students to remain on the Frostburg campus for four years while receiving a B.S. degree in electrical engineering from UM,CP.
- During the freshman and sophomore years, you will be enrolled as a pre-engineering major. You will complete general education and engineering science courses taught by faculty on-site at FSU. FSU tuition rates will apply.
- You must complete UM,CP's general education program requirements, as outlined under the GEP for Engineering Majors section in this catalog.
- After completing 45 credits of designated course work, you must apply for admission to College Park's Clark School of Engineering. After meeting UMCP's admissions standards, you will be accepted into the second half of the program as an engineering major. UMCP's tuition rates will apply for this part of the program. You must re-apply for financial aid and scholarships through UM,CP.
- Upper level engineering courses will be delivered over interactive video from College Park to FSU. All laboratory and design courses will be taught by FSU faculty.

	For Major
Hours Required in Engineering:	52
Hours Required in Other Departments:	56
Total Hours Required:	108

Mission Statement

The mission of the FSU Collaborative Electrical Engineering Program is to provide excellent undergraduate education in electrical engineering; to establish close partnership with and provide technical knowledge to industry, government, and local business; to contribute to economic development within the state of Maryland, specifically in the Western Maryland region; and to provide related services to the campus community and community at large.

Program Educational Objectives

The Frostburg Collaborative Electrical Engineering Program will graduate engineers who have

1. Broad knowledge of mathematics, physical science, and engineering science with emphasis in selected specialization areas of electrical engineering to be successful in government, industry, private companies, and graduate schools.
2. Professional skills to function in multidisciplinary teams, use modern engineering tools and computer software, solve engineering problems, engage in design work or research, and communicate with professionals.
3. An understanding of professional responsibility to evaluate their ethical obligations to society, employers, employees, and their peers.
4. Motivation for life-long learning to update their technical knowledge and understanding of societal and contemporary issues.

Program Outcomes

The students of Frostburg Electrical Engineering Collaborative Program will demonstrate throughout the curriculum

- a. an ability to apply knowledge of mathematics, science, and engineering
- b. an ability to design and conduct experiments, as well as to analyze and interpret data
- c. an ability to design a system, component, or process to meet desired needs
- d. an ability to function on multi-disciplinary teams
- e. an ability to identify, formulate, and solve engineering problems
- f. an understanding of professional and ethical responsibility
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of electrical engineering solutions in a global and societal context
- i. a recognition of the need for and an ability to engage in life-long learning
- j. a knowledge of contemporary issues in electrical engineering
- k. an ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.

Summary of Pre-Engineering Requirements

1. Introductory Level Courses

(18 hours)

- ENES 100 Introduction to Engineering Design
- ENEE 114 Programming Concepts for Engineers
- ENEE 204 Basic Circuit Theory
- ENEE 206 Fundamental Electric and Digital Circuit Laboratory
- ENEE 241 Numerical Techniques in Engineering
- ENEE 244 Digital Logic Design

2. Required Courses in Other Departments

(40 hours)

CHEM 101 General Chemistry I (*Meets GEP requirement*)

CHEM 133 General Chemistry for Engineers (*preferred*)

or CHEM 102 General Chemistry II

ENGL 101 Freshman Composition (*Meets GEP requirement*)

ENGL 338 Technical Writing or ENGL 339 Scientific Writing (*Meets GEP requirement*)

MATH 236 Calculus I (*Meets GEP requirement*)

MATH 237 Calculus II

MATH 238 Calculus III

MATH 432 Differential Equations

PHYS 261 Principles of Physics I: Mechanics (*Meets GEP requirement*)

PHYS 262 Principles of Physics II: Electricity and Magnetism

PHYS 263 Principles of Physics III: Sound and Light

Summary of Engineering Requirements

1. Advanced Engineering Courses:

(23 hours)

ENEE 303 Analog and Digital Electronics

ENEE 307 Electronic Circuits Design Lab

ENEE 313 Introduction to Device Physics

ENEE 322 Signal and System Theory

ENEE 324 Engineering Probability

ENEE 350 Computer Organization

ENEE 381 Electromagnetic Wave Propagation

ENEE 408 Capstone Design Project

2. Required Physics Course:

(4 hours)

PHYS 312 Electricity and Magnetism (*substituting for ENEE 380*)

3. Elective Courses in Electrical Engineering:

(11 hours)

Must include two credits of advanced laboratory courses.

4. Elective Courses in Other Departments:

(12 hours)

At least three credits of the required 12 must be a 400-level Math course. The remaining credits may be selected from an approved list of math, physics, or mechanical engineering courses.

Mechanical Engineering

Collaborative Program

Major

Coordinator:

Julie Yi-Zun Wang,
Assistant Professor,
Department of Physics and
Engineering

- A collaborative program between Frostburg State University and the University of Maryland, College Park, which allows students to remain on the Frostburg campus for four years while receiving a B.S. degree in mechanical engineering from UM,CP.
- During the freshman and sophomore years, you will be enrolled as a pre-engineering major. You will complete general education and engineering science courses taught by faculty on-site at FSU. FSU tuition rates will apply.
- You must complete UMCP's general education program requirements, as outlined under the GEP for Engineering Majors section in this catalog.
- After completing 45 credits of designated course work, you must apply for admission to College Park's Clark School of Engineering. After meeting UM,CP's admissions standards, you will be accepted into the second half of the program as an engineering major. UMCP's tuition rates will apply for this part of the program. You must reapply for financial aid and scholarships through UM,CP.
- Upper level engineering courses will be delivered over interactive video from College Park to FSU. All laboratory and design courses will be taught by FSU faculty.

	For Major
Hours Required in Engineering:	66
Hours Required in Other Departments:	40
Total Hours Required:	106

Mission Statement

The mission of the FSU Collaborative Mechanical Engineering Program is to provide excellent undergraduate education in mechanical engineering; to establish close partnership with and provide technical knowledge to industry, government, and local business; to contribute to economic development within the state of Maryland, specifically in the Western Maryland region; and to provide related services to the campus community and community at large.

Program Educational Objectives

The Frostburg Collaborative Mechanical Engineering Program will graduate engineers who have

1. Broad knowledge of mathematics, physical science, and engineering science with emphasis in selected specialization areas of mechanical engineering to be successful in government, industry, private companies, and graduate schools.
2. Professional skills to function in multidisciplinary teams, use modern engineering tools and computer software, solve engineering problems, engage in design work or research, and communicate with professionals.
3. An understanding of professional responsibility to evaluate their ethical obligations to society, employers, employees, and their peers.
4. Motivation for life-long learning to update their technical knowledge and understanding of societal and contemporary issues.

Program Outcomes

The students of Frostburg Mechanical Engineering Collaborative Program will demonstrate throughout the curriculum

- a. an ability to apply knowledge of mathematics, science, and engineering
- b. an ability to design and conduct experiments, as well as to analyze and interpret data
- c. an ability to design a system, component, or process to meet desired needs
- d. an ability to function on multi-disciplinary teams
- e. an ability to identify, formulate, and solve engineering problems
- f. an understanding of professional and ethical responsibility
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of mechanical engineering solutions in a global and societal context
- i. a recognition of the need for and an ability to engage in life-long learning
- j. a knowledge of contemporary issues in mechanical engineering
- k. an ability to use the techniques, skills, and modern engineering tools necessary for mechanical engineering practice

Summary of Pre-Engineering Requirements

1. Engineering Science Courses

(12 hours)

- ENES 100 Introduction to Engineering Design
- ENES 102 Statics
- ENES 220 Mechanics of Materials
- ENES 221 Dynamics

2. Required Courses in Other Departments

(40 hours)

- CHEM 101 General Chemistry I (*Meets GEP requirement*)
- CHEM 133 General Chemistry for Engineers (*preferred*)
or CHEM 102 General Chemistry II
- ENGL 101 Freshman Composition (*Meets GEP requirement*)
- ENGL 339 Scientific Writing or ENGL 338 Technical Writing (*Meets GEP requirement*)
- MATH 236 Calculus I (*Meets GEP requirement*)
- MATH 237 Calculus II
- MATH 238 Calculus III
- MATH 432 Differential Equations
- PHYS 261 Principles of Physics I: Mechanics
(*Meets GEP requirement*)
- PHYS 262 Principles of Physics II: Electricity and Magnetism
- PHYS 263 Principles of Physics III: Sound and Light

Summary of Engineering Requirements

1. Required Engineering Courses

(36 hours)

- ENME 232 Thermodynamics
- ENME 350 Electronics and Instrumentation I
- ENME 271 Numerical Methods in Mechanical Engineering
- ENME 331 Fluid Mechanics
- ENME 332 Transfer Processes
- ENME 351 Electronics and Instrumentation II
- ENME 361 Vibration, Controls and Optimization I
- ENME 462 Vibration, Controls and Optimization II
- ENME 382 Engineering Materials and Manufacturing Processes
- ENME 392 Statistical Methods for Product and Process Development
- ENME 371 Product Engineering and Manufacturing
- ENME 472 Integrated Product and Process Development (*Capstone*)

2. Elective Hours in Department

(18 hours)