Advising Manual

for

Chemistry Programs

in the

Department of Chemistry and Physics

Mansfield University

Revised Fall 2007

PREFACE

This Advising Manual was prepared for those with an interest in chemistry at Mansfield University. It is intended as a guide to the programs and specific course requirements for the degree programs in chemistry in the Department of Chemistry and Physics. At the time of writing, all information contained in this manual was currently valid. Due to the dynamic nature of academic institutions, changes may have since been made to programs or requirements. For the most up-to-date information, consult a current university catalog (a pdf file of a current version is available online at "www.mansfield.edu/catalog") or the chemistry web page at "www.mansfield.edu/~chemistr". For more information about Mansfield University, contact the Admissions Office (Alumni Hall, Mansfield University, Mansfield, PA, 16933; by phone at (800) 577-6826 or (570) 662-4243; or online at "admissions.mnsfld.edu/ps/contact.cfm"). For more information about the Department of Chemistry and Physics, contact any of us at Grant Science Center, Mansfield University; phone and e-mail information are on the departmental web page.

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GREETINGS

Greetings from the Department of Chemistry and Physics at Mansfield University! Since you are reading this booklet, you will possibly have some contact with us in the future. We sincerely hope that whatever contact we may have will be educational and beneficial to you. We are a small but broadly-based, challenging, and caring department interested in your educational needs and aspirations. Chemistry surrounds us in all aspects of our lives and careers. We would like to help you see its relevance to your career plans. In whatever capacity, as a major, minor, or as part of your required curriculum, we will try to help you fully realize your goals. This Advising Manual describes various aspects of the department and the institution and some programs and unique opportunities available at Mansfield University. Please contact us if you have questions about any part of the chemistry program at Mansfield University. We wish you well in your academic endeavors.

CHEMISTRY AND CAREER OPTIONS

Chemistry is the branch of science that relates phenomena in the world around us with the properties and behavior of the atoms and molecules from which the world is made. The study of chemistry makes students aware of those relationships and prepares them for a variety of careers in business, industry, academia, and government. Opportunities within these areas range from laboratory and technical work, to sales, marketing, and customer service, to management and supervisory positions. A graduate with a chemistry major or minor has acquired many skills that employers seek, especially in the areas of problem solving and decision making.

Our programs prepare you for advanced studies a range of professions, including medicine, dentistry, optometry, and various aspects of the law, while our more recently developed tracks in forensic science and nanotechnology focus on these rapidly-growing disciplines. Many of our Bachelor of Science (B.S.) graduates continue their chemistry studies in graduate school. Another option for B.S. chemistry majors is to pursue a career in industry immediately upon graduation. The food, pharmaceutical, petroleum, and chemical industries offer positions involving both laboratory and non-laboratory work. In addition, Mansfield University offers a teacher certification program in chemistry, resulting in the Bachelor of Science in Education (B.S.E.). These graduates find themselves in great demand due to the national shortage of qualified high school science teachers.

In addition to the programs leading to the B.S. and B.S.E., the department provides service courses for several biology, physics, and health science programs and offers minors in chemistry and in forensic science. If we can give you assistance by providing additional information, please contact us.

THE DEPARTMENT OF CHEMISTRY AND PHYSICS

The Department of Chemistry and Physics at Mansfield University is housed in Grant Science Center. Expanded in 1971, Grant Science Center is shared with the Biology Department and contains extensive modern laboratory facilities, including lab-lecture rooms, separate instrumental laboratories, a planetarium, dark room, and stockroom.

In addition to the usual laboratory equipment and glassware, the department has available a large assortment of instrumentation available for student use, including:

- atomic absorption spectrometer
- gas chromatograph
- gas chromatograph/mass spectrometer
- high-performance liquid chromatograph
- Fourier-transform infrared spectrometer
- UV-visible spectrophotometers
- spectrofluorimeter
- nuclear magnetic resonance spectrometer

The facilities and equipment are used by students throughout their studies at Mansfield in a variety of supervised laboratory experiences, both in course work and in independent research. The entire chemistry curriculum is designed to give students a broadly-based background in the theory and practice of chemistry and is structured to meet the standards of the American Chemical Society and the needs of a small department.

Close student-faculty interaction assures students of access to and the attention of their faculty. Students and faculty often develop relationships that extend beyond the classroom, by interaction in social activities such as picnics, field trips, and athletics, to private conversations about research and career plans. During a visit to Grant Science Center, you may see students and faculty engaged in discussions of all sorts. Students often have a cup of coffee in the department office to pass a few minutes between classes, or drop in at their professor's office to chat. This informal, open spirit provides an optimal learning environment for both students and faculty.

OPPORTUNITIES AND ACTIVITIES

A quality undergraduate degree in more that an accumulation of courses in a major. Courses must be taught by faculty who care about each student's needs and talents. At Mansfield, courses within and without the major are taught by such faculty. Course in the major concentration must provide a solid basis for a student's future career. A list of courses required for the various chemistry degrees is presented in a later section. Additional courses required of all Mansfield students ensure a well-rounded liberal arts education.

However, a quality degree program also provides students with opportunities outside the classroom. In the Department of Chemistry and Physics, several such opportunities and activities exist for students to utilize their undergraduate experiences in non-traditional ways. All of these enhance the student's educational experience. Students should consider participating in such activities during their undergraduate experience.

Employment/Cooperative Education. As a chemistry major, you will have skills even before you graduate that employers are seeking. There are numerous opportunities for summer employment in academic or industrial laboratories. In academic labs, this experience involves students in current state-of-the-art research. In industrial labs, students may be involved with different experimental techniques, often new to them. Such experiences broaden students'

knowledge and increase their confidence. Announcements for these employment opportunities arrive regularly at Mansfield.

Several local industries have made arrangements with Mansfield students to continue their employment into the academic year. These students receive course credit for their work experience through a cooperative education agreement, enabling them to earn and learn at the same time.

Research. In addition to the experience in practical and routine laboratory practices gained by employment, there are opportunities for students to participate in faculty research projects. In these projects, students are primary researchers, working first-hand on a project and its analysis. Relationships between students and faculty become more collegial as they work toward the common goal of understanding a research problem. Engaging students actively in performing research gives them a valuable glimpse of basic research in action.

Chemistry Club. The Chemistry Club is a non-academic, social organization to which most chemistry majors belong. The Chemistry Club offers opportunities for students and faculty to meet in an informal setting. Activities include picnics, pizza parties, field trips, hosting speakers and school tours, and performing demonstrations for National Chemistry Week. Chemistry Club members are eligible to become student affiliate members of the American Chemical Society (ACS), the professional society for chemists in the United States. As an ACS affiliate, the student is provided with the advantages of a professional society, including a student newsletter, career opportunities, employment aids, and current scientific information.

GENERAL PROGRAM REQUIREMENTS

B.S. in Chemistry

The Department of Chemistry and Physics offers a major program (120 credits total) leading to the Bachelor of Science (B.S.) in Chemistry with four different concentrations: chemistry, forensic science, biochemistry, and nanotechnology.

The four concentrations share a common core of 49 credits of chemistry, physics, and math courses (course descriptions may be found at the end of this manual):

CHM	1111	General Chemistry I	4	MA	2231	Calculus I	4
CHM	1112	General Chemistry II	4	MA	2232	Calculus II	4
CHM	3301	Organic Chemistry I	4	MA	xxxx	Math Elective (1125 or higher)	3
CHM	3302	Organic Chemistry II	4				
CHM	3311	Quantitative Analysis	4	PHY	2210	General Physics I	4
CHM	3321	Physical Chemistry I	4	PHY	2211	General Physics II	4
CHM	3332	Instrumental Analysis	4				
CHM	4410	Seminar	1				
CHM	4410	Seminar	1				

The four concentrations differ in their requirements for upper-level courses:

Chemistry Concentration: (21 credits)

CHM	3322	Physical Chemistry II	4
CHM	4420	Qualitative Organic Chemistry	3
CHM	4431	Advanced Inorganic Chemistry	4
CHM	xxxx	Chemistry Electives (3341, 4421, 4432)	6
MA	2233	Calculus III	4

Forensic Science Concentration: (27 credits)

SCI	1104	Introduction to Forensic Science	3
CHM	3264	Chemical Methods in Forensic Science	3
CHM	4420	Qualitative Organic Chemistry	3
PHY	3264	Physical Methods in Forensic Science	3
MA	2233	Calculus III	4

One of the following:

CJA	3262	Investigation and Interrogation	3
CJA	3336	Criminalistics	3
CJA	3355	Evidence and Criminal Procedure	3

Two of the following:

CHM	3322	Physical Chemistry II	4
CHM	3341	Biochemistry	4
CHM	4431	Advanced Inorganic Chemistry	4
BI	3370	Cell Biology	4

Biochemistry Concentration: (21 credits)

CHM	3341	Biochemistry	4
BI	3370	Cell Biology	4
BI	xxxx	Biology Electives (3310, 3371, 3372, 3374, 3375)	6

One of the following:

CHM	3322	Physical Chemistry II	4
CHM	4431	Advanced Inorganic Chemistry	4

One of the following:

CHM	4420	Qualitative Organic Chemistry	3
CHM	4421	Advanced Organic Chemistry	3

Nanotechnology Concentration: (21-22 credits)

SCI	3270	Nanotechnology Laboratory Experience	18

One of the following:

CHM	3322	Physical Chemistry II	4
CHM	4420	Qualitative Organic Chemistry	3
CHM	4421	Advanced Organic Chemistry	3
CHM	4431	Advanced Inorganic Chemistry	4

B.S.E. in Secondary Education/Chemistry

The Department also offers a program (124-125 credits total) leading to the Bachelor of Science in Education and certification as a qualified chemistry teacher in secondary schools. Required courses for the major include (99-100 credits):

BI	3370	Cell Biology	4
CHM	1111	General Chemistry I	4
CHM	1112	General Chemistry II	4
CHM	3301	Organic Chemistry I	4
CHM	3302	Organic Chemistry II	4
CHM	3311	Quantitative Analysis	4
CHM	3321	Physical Chemistry I	4
CHM	3332	Instrumental Analysis	4
CHM	4410	Seminar	1
CHM	4410	Seminar	1
CHM	xxxx	Chemistry Electives (3322, 3341, 3352, 4420, 4421, 4431, 4432)	6
ED	1102	Introduction to Education	3
ED	2205	Educational Psychology	3
ED	3260	Assessment in Education	3
ED	3310	Content Area Reading and Writing	3
ED	3313	Teaching Secondary Science	3
ED	3320	Observation and Participation	3
ED	4400	Student Teaching	12
ED	4460	Professional Seminar	2
ENG	xxxx	Literature	3
MA	2231	Calculus I	4
PSY	1101	Introduction to General Psychology	3
PSY	3321	Adolescent Psychology	3
SPE	3275	Inclusion of Diverse Learners	3

One of the following:

MA	1125	Introductory Statistics I	3
MA	2232	Calculus II	4

One of the following:

PHY	1191	Physics I	4
PHY	2210	General Physics I	4

One of the following:

PHY	1192	Physics II	4
PHY	2211	General Physics II	4

General Education

Besides the course requirements for the major programs, all four-year students at Mansfield University must complete a General Education program. The General Education program has a core of 16 credits:

UNV	1100	First-Year Experience Seminar	1
COM	1101	Oral Communication	3
ENG	1112	Composition I	3
ENG	3313	Composition II	3

One of the following Fine Arts courses:

ARH	1101	Introduction to Art	3
MU	1101	Introduction to Music	3
THT	1110	Introduction to Theater	3

Three credits from the following Wellness courses:

BUS	2202	Personal Finance	3
DIT	1101	Personal Nutrition	3
DIT	2211	Introduction to Nutrition	3
DIT	2220	Nutrition and Exercise	3
DIT	3300	Cultural Nutrition and Food	3
HPE	1100-1199		1
HPE	3340	First Aid and CPR	3
MEN	3331	Mountie Marching Band	1
NUR	4402	Women's Health Issues	3
NUR	4433	Health Promotion and Disease Prevention Strategies	3
PSY	4421	Death and Dying	3

The General Education program also includes coursework (21 credits) in other disciplinary areas. Requirements for three credits of Mathematics, six credits of Natural Science, and nine credits of unspecified General Education Electives are already met by the major requirements described above. Additionally, students in Chemistry programs must earn six credits each in the areas of Humanities and of Languages and Literature, and nine credits in the area of Social

Sciences. *Students should consult the University catalog or registration master schedules to identify specific courses that meet these requirements*.

Further General Education requirements for courses designated as addressing Information Literacy, or approved for Writing Across the Curriculum, are already met by General Education core courses and by the major requirements described above. Chemistry majors must take three courses designated as addressing Global Awareness, with at least one at the upper level (3000 or higher). *Students should consult registration master schedules to identify specific courses that meet this requirement*.

There is a University graduation requirement that at least 40% of your coursework (48 semester hours) be at the upper level (3000 or higher). Most of this requirement is met by the General Education and major requirements described above, but some Chemistry students may need to take an upper-level nonmajor course beyond those specified among their General Education courses.

SPECIFIC FOUR-YEAR PLANS

The following pages list recommended four-year sequences of coursework for the programs described above. Because some upper-level courses are not offered every year, course sequences will vary somewhat depending whether a student begins in an odd or an even year. Descriptions for each program are followed by a checklist which students should complete as they meet the various requirements.

B.S. Chemistry, Chemistry Concentration
(odd-year start)

Fall 2007	CHM 1111	4	Spring 2008	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2008	CHM 3301	4	Spring 2009	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2009	CHM 3321	4	Spring 2010	CHM 4410	1	
	CHM 4420	3		CHM 4432 or Free Elective	3	
	PHY 2211	4		CHM 4431	4	
	MA 2233	4		ENG 3313	3	
				Gen. Ed.	3	
		15			14	29
Fall 2010	CHM 4421 or Free Elective	3	Spring 2011	CHM 3322	4	
	CHM 4490 or Free Elective	3		CHM 3341 or Free Elective	3	
	Gen. Ed.	6		CHM 4410	1	
	Free Elective	3		Gen. Ed.	3	
				Free Electives	4	
		15			15	30
				Total		120

B.S. Chemistry, Chemistry Concentration
(even-year start)

Fall 2006	CHM 1111	4	Spring 2007	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2007	CHM 3301	4	Spring 2008	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2008	CHM 3321	4	Spring 2009	CHM 3322	4	
	CHM 4421 or Free Elective	3		CHM 4410	1	
	PHY 2211	4		CHM 3341 or Free Elective	3	
	MA 2233	4		ENG 3313	3	
				Gen. Ed.	3	
		15			14	29
Fall 2009	CHM 4420	3	Spring 2010	CHM 4410	1	
	CHM 4490 or Free Elective	3		CHM 4432 or Free Elective	3	
	Gen. Ed.	6		CHM 4431	4	
	Free Elective	3		Gen. Ed.	3	
				Free Electives	4	
		15			15	30
				Total		120

B.S. Chemistry, Chemistry Concentration: Checklist

General Education Requirements

Core requirements

_____ UNV 1100
_____ COM 1101
_____ ENG 1112
_____ ENG 3313
_____ Fine Arts
_____ Wellness

Group 1: Humanities

_____
_____

Group 2: Languages and Literature

_____
_____

Group 3: Mathematics (met by major requirements)

Group 4: Natural Sciences (met by major requirements)

Group 5: Social Sciences

_____
_____
_____

Group 6: Electives (met by major requirements)

Writing Across the Curriculum (check to be sure this has been met by Gen. Ed. and major requirements)

Information Literacy (check to be sure this has been met by Gen. Ed. and major requirements)

Global Awareness

_____
_____
_____

Major Requirements

Core requirements

_____ CHM 1111
_____ CHM 1112
_____ CHM 3301
_____ CHM 3302
_____ CHM 3311
_____ CHM 3321
_____ CHM 3332
_____ CHM 4410
_____ CHM 4410
_____ MA Elective
_____ MA 2231
_____ MA 2232
_____ PHY 2210
_____ PHY 2211

Concentration Requirements

_____ CHM 3322
_____ CHM 4420
_____ CHM 4431
_____ CHM Elective
_____ CHM Elective
_____ MA 2233

Graduation Requirements

_____ 120 credits

(48 credits upper level; program provides 42-43)

_____ Two additional upper-level
_____ courses (6 credits)

B.S. Chemistry, Forensic Science Concentration
(odd-year start)

Fall 2007	CHM 1111	4	Spring 2008	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2008	CHM 3301	4	Spring 2009	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		SCI 1104	3	
		15			15	30
Fall 2009	CHM 4420	3	Spring 2010	CHM 3264	3	
	PHY 2211	4		CHM 4410	1	
	PHY 3264	3		CHM 4431 or Free Elective	3	
	MA 2233	4		ENG 3313	3	
				Gen. Ed.	6	
		14			16	30
Fall 2010	CHM 3321	4	Spring 2011	CHM 3322 or Gen. Ed.	3	
	BI 3370 or Free Elective	3		CHM 3341 or Gen. Ed.	3	
	CJA Elective or Gen. Ed.	3		CHM 4410	1	
	Gen. Ed.	3		CJA Elective or Gen. Ed.	3	
				Free Electives	6	
		13			16	29
				Total		120

B.S. Chemistry, Forensic Science Concentration
(even-year start)

Fall 2006	CHM 1111	4	Spring 2007	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2007	CHM 3301	4	Spring 2008	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		SCI 1104	3	
		15			15	30
Fall 2008	CHM 3321	4	Spring 2009	CHM 3322 or Gen. Ed.	3	
	PHY 2211	4		CHM 3341 or Gen. Ed.	3	
	MA 2233	4		CHM 4410	1	
	CJA Elective or Gen. Ed.	3		ENG 3313	3	
				Gen. Ed.	3	
		15			13	28
Fall 2009	CHM 4420	3	Spring 2010	CHM 3264	3	
	PHY 3264	3		CHM 4410	1	
	BI 3370 or Free Elective	3		CHM 4431 or Free Elective	3	
	Gen. Ed.	6		CJA Elective or Gen. Ed.	3	
				Free Electives	6	
		15			16	31
				Total		120

B.S. Chemistry, Forensic Science Concentration: Checklist

General Education Requirements

Core requirements

_____ UNV 1100
_____ COM 1101
_____ ENG 1112
_____ ENG 3313
_____ Fine Arts
_____ Wellness

Group 1: Humanities

_____
_____

Group 2: Languages and Literature

_____
_____

Group 3: Mathematics (met by major requirements)

Group 4: Natural Sciences (met by major requirements)

Group 5: Social Sciences

_____
_____
_____

Group 6: Electives (met by major requirements)

Writing Across the Curriculum (check to be sure this has been met by Gen. Ed. and major requirements)

Information Literacy (check to be sure this has been met by Gen. Ed. and major requirements)

Global Awareness

_____
_____
_____

Major Requirements

Core requirements

_____ CHM 1111
_____ CHM 1112
_____ CHM 3301
_____ CHM 3302
_____ CHM 3311
_____ CHM 3321
_____ CHM 3332
_____ CHM 4410
_____ CHM 4410
_____ MA Elective
_____ MA 2231
_____ MA 2232
_____ PHY 2210
_____ PHY 2211

Concentration Requirements

_____ SCI 1104
_____ CHM 3264
_____ CHM 4420
_____ PHY 3264
_____ MA 2233

_____ CHM/BI Electives (CHM
_____ 3322, 3341, or 4431; or BI 3370)

_____ CJA Elective (3262, 3336, or 3355)

Graduation Requirements

_____ 120 credits

(48 credits upper level; program provides 45)

_____ One additional upper-level course (3 credits)

B.S. Chemistry, Biochemistry Concentration
(odd-year start)

Fall 2007	CHM 1111	4	Spring 2008	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2008	CHM 3301	4	Spring 2009	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2009	CHM 3321	4	Spring 2010	CHM 4410	1	
	CHM 4420 or Gen. Ed.	3		CHM 4431 or Gen. Ed.	3	
	BI 3370	4		BI Elective	3	
	PHY 2211	4		ENG 3313	3	
				Free Elective	3	
		15			13	28
Fall 2010	CHM 4421 or Gen. Ed.	3	Spring 2011	CHM 3322 or Gen. Ed.	3	
	CHM 4490 or Free Elective	3		CHM 3341	4	
	BI Elective	3		CHM 4410	1	
	Gen. Ed.	3		Gen. Ed.	3	
	Free Elective	3		Free Electives	5	
		15			16	31
				Total		120

B.S. Chemistry, Biochemistry Concentration
(even-year start)

Fall 2006	CHM 1111	4	Spring 2007	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101 or ENG 1112	3		ENG 1112 or COM 1101	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2007	CHM 3301	4	Spring 2008	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2008	CHM 3321	4	Spring 2009	CHM 4410	1	
	CHM 4421 or Gen. Ed.	3		CHM 3322 or Gen. Ed.	3	
	BI 3370	4		CHM 3341	4	
	PHY 2211	4		BI Elective	3	
				ENG 3313	3	
		15			14	29
Fall 2009	CHM 4420 or Gen. Ed.	3	Spring 2010	CHM 4431 or Gen. Ed.	3	
	CHM 4490 or Free Elective	3		CHM 4410	1	
	BI Elective	3		Gen. Ed.	3	
	Gen. Ed.	3		Free Electives	8	
	Free Elective	3				
		15			15	30
				Total		120

B.S. Chemistry, Biochemistry Concentration: Checklist

General Education Requirements

Core requirements

_____ UNV 1100
_____ COM 1101
_____ ENG 1112
_____ ENG 3313
_____ Fine Arts
_____ Wellness

Group 1: Humanities

_____
_____

Group 2: Languages and Literature

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_____

Group 3: Mathematics (met by major requirements)

Group 4: Natural Sciences (met by major requirements)

Group 5: Social Sciences

_____
_____
_____

Group 6: Electives (met by major requirements)

Writing Across the Curriculum (check to be sure this has been met by Gen. Ed. and major requirements)

Information Literacy (check to be sure this has been met by Gen. Ed. and major requirements)

Global Awareness

_____
_____
_____

Major Requirements

Core requirements

_____ CHM 1111
_____ CHM 1112
_____ CHM 3301
_____ CHM 3302
_____ CHM 3311
_____ CHM 3321
_____ CHM 3332
_____ CHM 4410
_____ CHM 4410
_____ MA Elective
_____ MA 2231
_____ MA 2232
_____ PHY 2210
_____ PHY 2211

Concentration Requirements

_____ CHM 3341
_____ CHM 4420 or 4421
_____ CHM 3322 or 4431
_____ BI 3370
_____ BI Electives (3310, 3371, 3372,
_____ 3374, or 3375)

Graduation Requirements

_____ 120 credits

(48 credits upper level; program provides 46-48)

_____ May need one additional upper-level course (3 credits)

B.S. Chemistry, Nanotechnology Concentration
(odd-year start)

Fall 2007	CHM 1111	4	Spring 2008	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101	3		ENG 1112	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2008	CHM 3301	4	Spring 2009	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2009	CHM 3321	4	Spring 2010	CHM 4410	1	
	CHM 4420 or Free Elective	3		CHM 4431 or Free Elective	3	
	PHY 2211	4		ENG 3313	3	
	MA 2233	4		Gen. Ed.	6	
		15			13	28
Fall 2010	SCI 3270	18	Spring 2011	CHM 3322 or Free Elective	3	
				CHM 4410	1	
				Gen. Ed.	6	
				Free Elective	3	
		18			13	31
				Total		120

B.S. Chemistry, Nanotechnology Concentration
(even-year start)

Fall 2006	CHM 1111	4	Spring 2007	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101	3		ENG 1112	3	
	UNV 1100	1		Gen. Ed.	6	
	Fine Arts	3				
		14			17	31
Fall 2007	CHM 3301	4	Spring 2008	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	MA 2232	4		PHY 2210	4	
	Gen. Ed.	3		Gen. Ed.	3	
		15			15	30
Fall 2008	CHM 3321	4	Spring 2009	CHM 4410	1	
	CHM 4421 or Free Elective	3		CHM 3332 or Free Elective	3	
	PHY 2211	4		ENG 3313	3	
	MA 2233	4		Gen. Ed.	6	
		15			13	28
Fall 2009	SCI 3270	18	Spring 2010	CHM 4431 or Free Elective	3	
				CHM 4410	1	
				Gen. Ed.	6	
				Free Elective	3	
		18			13	31
				Total		120

B.S. Chemistry, Nanotechnology Concentration: Checklist

General Education Requirements

Core requirements

_____ UNV 1100
_____ COM 1101
_____ ENG 1112
_____ ENG 3313
_____ Fine Arts
_____ Wellness

Group 1: Humanities

_____
_____

Group 2: Languages and Literature

_____
_____

Group 3: Mathematics (met by major requirements)

Group 4: Natural Sciences (met by major requirements)

Group 5: Social Sciences

_____
_____
_____

Group 6: Electives (met by major requirements)

Writing Across the Curriculum (check to be sure this has been met by Gen. Ed. and major requirements)

Information Literacy (check to be sure this has been met by Gen. Ed. and major requirements)

Global Awareness

_____
_____
_____

Major Requirements

Core requirements

_____ CHM 1111
_____ CHM 1112
_____ CHM 3301
_____ CHM 3302
_____ CHM 3311
_____ CHM 3321
_____ CHM 3332
_____ CHM 4410
_____ CHM 4410
_____ MA Elective
_____ MA 2231
_____ MA 2232
_____ PHY 2210
_____ PHY 2211

Concentration Requirements

_____ SCI 3270
_____ CHM Elective (3322, 4420, 4421, or 4431)

Graduation Requirements

_____ 120 credits

(48 credits upper level; program provides 46-47)

_____ One additional upper-level course (3 credits)

B.S.E. Chemistry
(odd-year start)

Fall 2007	CHM 1111	4	Spring 2008	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101	3		ENG 1112	3	
	UNV 1100	1		PSY 1101	3	
	ED 1102	3		ENG xxxx (Lit. Elective)	3	
		14			17	31
Fall 2008	CHM 3301	4	Spring 2009	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	PHY 1191 or PSY 3321	3		PHY 1192 or 2210	4	
	MA 1125 or 2232	3		ED 2205	3	
	Fine Arts	3				
		17			15	32
Fall 2009	CHM 3321	4	Spring 2010	CHM 4410	1	
	PHY 2211 or PSY 3321	3		CHM Elective	3	
	ED 3310	3		ED 3313	3	
	ED 3320	3		ENG 3313	3	
	Gen. Ed.	3		Gen. Ed.	6	
		16			16	32
Fall 2010	CHM Elective	3	Spring 2011	CHM 4410	1	
	BI 3370	4		ED 4400	12	
	ED 3260	3		ED 4460	2	
	SPE 3275	3				
	Gen. Ed.	3				
		16			15	31
				Total		126

B.S.E. Chemistry
(even-year start)

Fall 2006	CHM 1111	4	Spring 2007	CHM 1112	4	
	MA 1165	3		MA 2231	4	
	COM 1101	3		ENG 1112	3	
	UNV 1100	1		PSY 1101	3	
	ED 1102	3		ENG xxxx (Lit. Elective)	3	
		14			17	31
Fall 2007	CHM 3301	4	Spring 2008	CHM 3302	4	
	CHM 3311	4		CHM 3332	4	
	PHY 1191 or PSY 3321	3		PHY 1192 or 2210	4	
	MA 1125 or 2232	3		ED 2205	3	
	Fine Arts	3				
		17			15	32
Fall 2008	CHM 3321	4	Spring 2009	CHM 4410	1	
	PHY 2211 or PSY 3321	3		CHM Elective	3	
	ED 3310	3		ED 3313	3	
	ED 3320	3		ENG 3313	3	
	Gen. Ed.	3		Gen. Ed.	6	
		16			16	32
Fall 2009	CHM Elective	3	Spring 2010	CHM 4410	1	
	BI 3370	4		ED 4400	12	
	ED 3260	3		ED 4460	2	
	SPE 3275	3				
	Gen. Ed.	3				
		16			15	31
				Total		126

B.S.E. Chemistry: Checklist

General Education Requirements

Core requirements

- _____ UNV 1100
- _____ COM 1101
- _____ ENG 1112
- _____ ENG 3313
- _____ Fine Arts
- _____ Wellness

Group 1: Humanities

- _____
- _____

Group 2: Languages and Literature (3 credits met by major requirements)

- _____

Group 3: Mathematics (met by major requirements)

Group 4: Natural Sciences (met by major requirements)

Group 5: Social Sciences (met by major requirements)

Group 6: Electives (met by major requirements)

Writing Across the Curriculum (check to be sure this has been met by Gen. Ed. and major requirements)

Information Literacy (check to be sure this has been met by Gen. Ed. and major requirements)

Global Awareness

- _____
- _____
- _____

Major Requirements

- _____ BI 3370
- _____ CHM 1111
- _____ CHM 1112
- _____ CHM 3301
- _____ CHM 3302
- _____ CHM 3311
- _____ CHM 3321
- _____ CHM 3332
- _____ CHM 4410
- _____ CHM 4410
- _____ CHM Elective
- _____ CHM Elective
- _____ ED 1102
- _____ ED 2205
- _____ ED 3260
- _____ ED 3310
- _____ ED 3313
- _____ ED 3320
- _____ ED 4400
- _____ ED 4460
- _____ ENG (Lit. Elective)
- _____ MA 2231
- _____ MA Elective
- _____ PHY 1191/2210
- _____ PHY 1192/2211
- _____ PSY 1101
- _____ PSY 3321
- _____ SPE 3275

Graduation Requirements

- _____ 120 credits

(48 credits upper level; program provides 67)

CHEMISTRY/PHYSICS COURSE DESCRIPTIONS

For other course descriptions (BI, MA, SCI, etc.), consult a current catalog.

*CHM 1111 GENERAL CHEMISTRY I 4 cr. [3, 0, 3]
For science majors. A study of the fundamental principles of chemistry from the standpoint of stoichiometry, gases, states of matter, solutions and equilibrium theory. Laboratory sessions stress the chemical principles discussed in the lecture.

*CHM 1112 GENERAL CHEMISTRY II 4 cr. [3, 0, 3]
A continuation of 1111: kinetics, thermodynamics, oxidation-reduction, atomic and molecular structure, bonding, and periodic relationships are studied. The laboratory work is an introduction to qualitative analysis and includes experiments designed to exemplify chemical principles. Prerequisite: CHM 1111.

CHM 3264 CHEM MTDS FOREN SCI 3 cr. [2, 0, 2]
An advanced treatment of the chemical methods used in the investigation of criminal activities. The use and reliability of chemical tests, solubilities, and reactions as well as the chemistry of chromatographic, spectroscopic and instrumental analysis will be included. Prerequisites: CHM-1110 SCI-1104 SCI-1107. Corequisite course: CHM 3264L

CHM 3301 ORGANIC CHEMISTRY I 4 cr. [3, 0, 4]
Fundamentals of organic chemistry are presented. Modern theory, reaction mechanisms and stereochemistry are included along with nomenclature, preparation, reactions and properties of organic compounds. The laboratory stresses syntheses, chemical and physical properties and an introduction to instrumental techniques. The laboratory period includes one hour of lecture on theory and techniques of laboratory operations. Prerequisite: CHM 1112.

CHM 3302 ORGANIC CHEMISTRY II 4 cr. [3, 0, 4]
A continuation of 3301. The laboratory period includes one hour of lecture on theory and techniques of laboratory operations. Prerequisite: CHM 3301.

CHM 3311 QUANTITATIVE ANALYSIS 4 cr. [3, 0, 4]
An introductory course in analytical chemistry emphasizing classical titrimetric and gravimetric methods and related theories. Prerequisite: CHM 1112.

CHM 3321 PHYSICAL CHEMISTRY I 4 cr. [3, 0, 4]
An introduction to the methods and topics of physical chemistry. Topics include introduction to thermodynamics, equilibria, kinetics, atomic structure, and molecular spectroscopy. Prerequisite: CHM 1112, 3302, MA2231, PHY 2210 and 2211.

CHM 3322 PHYSICAL CHEMISTRY II 4 cr. [3, 0, 4]
A continuation of 3321. Advanced study of the methods and topics covered in physical chemistry I. MA 2233 is required. Prerequisite: CHM 3321 and MA 2232.

CHM 3332 INSTRUMENTAL ANALYSIS 4 cr. [3, 0, 4]
Deals with the principles and applications of instrumental methods in chemical analysis. Studies include electroanalytical, spectrophotometric, and chromatographic techniques. Prerequisite: CHM 3311.

CHM 3341 BIOCHEMISTRY 4 cr. [3, 0, 3]
A study of carbohydrates, lipids, proteins, enzymes, nucleic acids, vitamins, and hormones in terms of structure, function, and synthesis in living systems. The laboratory includes the isolation, identification, and chemical behavior of biochemically important

molecules. Prerequisite: CHM 3302 or permission of instructor.

CHM 4410 SEMINAR 1 cr. [1, 0, 0]

Deals with reports emphasizing chemical literature searches and/or current research. Prerequisite: upper division chemistry major.

CHM 4420 QUALITATIVE ORGANIC CHEMISTRY 3 cr. [2, 0, 4]

The identification of organic compounds by various classical and instrumental techniques. Prerequisite: CHM 3302.

CHM 4421 ADVANCED ORGANIC CHEMISTRY 3 cr. [3, 0, 0]

An advanced lecture course designed to deepen and expand knowledge in the field. Topics such as reactions, mechanisms, reactive intermediates, photochemistry, kinetics, stereochemistry, natural products, and spectroscopy may be stressed. Prerequisite: CHM 3302 and 3321.

CHM 4431 ADVANCED INORGANIC CHEMISTRY 4 cr. [3, 0, 4]

A presentation of atomic structure and periodic properties. In addition to other topics; valence bond, molecular orbital, crystal field and ligand field theories are treated. Laboratory sessions include one hour of lecture on theory and techniques in the preparation of representative compounds. Prerequisite: CHM 1112 and 3321.

CHM 4432 STRUCTURAL CHEMISTRY 3 cr. [3, 0, 0]

The symmetry and structural properties of molecular systems are utilized to determine their energy levels. The electronic and vibrational spectroscopic properties of these systems will be predicted also utilizing symmetry properties. These spectra-structure correlations will be made on organic and inorganic systems. Prerequisite: CHM 3302 and 3321.

CHM 4490 PROBLEMS IN CHEMISTRY 1 - 3 cr. [0, 0, variable]

Involves the student in study projects under the direct supervision of an instructor. Library and laboratory research in selected problems. Prerequisite: Permission of instructor. May be taken for one through three credits.

PHY 1180 QUANTITATIVE METHODS FOR THE PHYSICAL SCIENCES 3 cr. [3, 0, 0]

Introduction to the application of mathematical analysis to physical situations. Problem solving using algebraic, statistical, calculus, and computer methods. Corequisite: MA 2231.

*PHY 1191 PHYSICS I 4 cr. [3, 1, 2]

A one-year sequential calculus physics course discussing classical mechanics, fluids, thermodynamics, classical electricity and magnetism, optics and waves, modern physics. Application of physics to life science is made in problem selection and laboratory experimentation. Corequisite: MA 2231.

*PHY 1192 PHYSICS II 4 cr. [3, 1, 2]

Continuation of PHY 1191. Prerequisite: PHY 1191.

*PHY 2210 GENERAL PHYSICS I 4 cr. [3, 1, 2]

A calculus based, introductory physics course emphasizing classical concepts. Selected topics include: motion, work and energy, gravitation, electricity and magnetism, and electromagnetic waves. Prerequisite: MA 2231. Co-requisite: MA 2232.

*PHY 2211 GENERAL PHYSICS II 4 cr. [3, 1, 2]

Continuation of PHY 1191 or 2210. Corequisite MA 2233.

PHY 3264 PHYSICAL METHODS IN FORENSIC SCIENCE 3 cr. [2, 0, 2]

An advanced treatment of the physical methods used in the investigation of criminal activities. Topics covered include: statistical treatment of data, material properties of matter, ballistics, hair and fiber identification, physical markings, and spectral analysis. Prerequisites: CHM 1110, SCI 1104, SCI 1107