

Department of Chemistry

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The Department of Chemistry has as its objectives preparation and training in both scientific principles and skills for chemists seeking industrial or governmental employment; students planning graduate study in the sciences or advanced professional courses of study in medicine or engineering; science teachers in public or private schools; and for students wishing to meet institutional requirements in chemistry.

Programs in the department lead to the Bachelor of Science degree with majors or concentrations in Professional Chemistry, Chemistry, or Science. The Professional Chemistry Program does not require a minor, and the other programs require a minor of at least 18 semester hours. Minors are also offered in Chemistry and Science. In addition, pre-professional programs for cytotechnology, dentistry, dental hygiene, health information management, medicine (optometry), medical technology, nuclear medicine technology, occupational therapy, pharmacy, physical therapy, and radiation therapy technology are offered under the Health Sciences concentration.

Environmental Science and Technology is an interdisciplinary major and minor offered by Agribusiness and Agriscience, Biology, Chemistry, Engineering Technology and Industrial Studies, and Physics and Astronomy. A complete description of the program can be found under the Department of Engineering Technology and Industrial Studies.

A grade of C or better is required on all transfer credits accepted as part of a major or minor in the Department of Chemistry. Students must have a grade point average of at least 2.00 on courses counting toward a major or minor in any of the department's programs.

Laboratory safety is of primary importance in the Department of Chemistry. Students are required to follow **all** laboratory safety rules, a statement of which will be provided to all students at the first laboratory period. **Approved safety goggles must be worn at all times while in the laboratory.** Failure to comply with any of

the laboratory rules may result in the student's removal from the laboratory for that laboratory period. Continued violation of safety rules can result in the withdrawal of the student from the course.

In all curricular listings, (Area __) refers to the General Studies requirements as outlined on pages 59-61.

Major in Chemistry, Professional Concentration

The Professional Chemistry concentration in the Chemistry major, approved by the American Chemical Society, consists of 48 semester hours in chemistry including CHEM 1110, 1111, 1120, 1121, 2230, 3010, 3020, 4400, 4350, 4360, 4230, 3530 or 4500, 4410 and 4430 plus at least 4 hours (including one hour of lab) from CHEM 4100, 4700/4780, 4730, 4000, 4510/4530, 4880, 4600, or 4610; mathematics through MATH 1920; MATH 3110 or PHYS 3150; PHYS 2010, 2011, 2020, 2021 (or 2110, 2111, 2120, 2121) and computer science approved by advisor. A minimum of 12 upper-division hours in the Chemistry major must be taken at MTSU. No minor is required for this major.

Recommended Sequence

FRESHMAN		SOPHOMORE	
CHEM 1110, 1111,		CHEM 2230, 3010, 3020	13
1120, 1121	8	PHYS 2010, 2011, 2020,	
MATH 1730, 1910	8	2021 (or 2110, 2111,	
BIOL 1110, 1120 (Area IV-A)	8	2120, 2121)	8
ENGL 1010, 1020 (Area I-A)	6	MATH 1920	4
PHED or M S (Area V)	2	ENGL 2030 (Area II-A)	3
	32	CSCI 1150	3
		PHED or M S (Area V)	2
			33
JUNIOR		SENIOR	
CHEM 3180, 4400, 4350,		CHEM 4230	4
4360, 4410	16	CHEM 4100, 4500,	
ENGL 2--- (Area II-A)	3	4700/4780, 4730, or 4880	8
HIST 2010, 2020, or 2030		Gen. Studies (Area III-B)	3
(Area III-A)	6	Electives	17
MATH 3110 or PHYS 3150	4		32
Gen. Studies electives			
(Areas I-B, II-B)	6		
	35		

Major in Chemistry

The Chemistry major consists of 36 semester hours in chemistry including CHEM 1110, 1111, 1120, 1121, 2230, 3010, 3020, 4330, 4340 (or 4350, 4360), and at least 7 hours from among the upper-division electives: CHEM (3530 or 4500), 4000, 4400, 4100, (4700 or 4780), 4600, (4630 or 4230), and PSCI 4080. Also required are MATH 1910; PHYS 2010, 2011, 2020, 2021; CSCI 1150; and fulfillment of University General Studies requirements. A minimum of 12 upper-division hours in the Chemistry major must be taken at MTSU.

NOTE: Students who wish to get jobs as chemists are strongly encouraged to take additional upper-division courses, especially CHEM 4630, follow the plan for the professional major, or take more advanced chemistry courses upon graduation.

Recommended Sequence**FRESHMAN**

CHEM 1110, 1111, 1120, 1121	8	SOPHOMORE	
MATH 1730*, 1910	8	CHEM 2230	5
BIOL 1110, 1120 (Area IV-A)	8	CHEM 3010, 3020	8
ENGL 1010, 1020 (Area I-A)	6	ENGL 2030, 2--- (Area II-A)	6
PHED or M S (Area V)	2	HIST 2010, 2020, or 2030 (Area III-A)	6
	32	CSCI 1150	3
		PHED or M S (Area V)	2
		Gen. Studies (Area I-B)	3
			33

JUNIOR

Chemistry electives**	7-8	SENIOR	
PHYS 2010, 2011, 2020, 2021	8	CHEM 4330, 4340	8
Gen. Studies (Areas II-B and III-B)	6	Electives	24-25
Electives	12		32-33
	33-34		

*Can substitute MATH 1710, 1720

**Upper-division chemistry elective from the following: CHEM 3530 or 4500, 4400, 4100, 4700/4780, 4600, 4610, 4630 or 4230 or 4000

Minor in Chemistry

The minor in Chemistry consists of 19 semester hours of chemistry, including CHEM 1110, 1111, 1120, and 1121 with a maximum of 8 hours in freshman-level chemistry. At least four upper-division hours must be taken at MTSU.

Teacher Licensure in Chemistry (7-12)

Students seeking a license to teach chemistry in secondary schools (grades 7-12) must complete (1) a major in Chemistry, (2) a minor in professional education, and (3) courses in addition to the General Studies requirements.

Enhanced General Education Requirements

In addition to the General Studies requirements (see pages 59-61), the following courses are required for licensure in chemistry:

MATH 1910 Calculus I
 CSCI 1150 Computer Orientation
 BIOL 1110, 1120 General Biology
 CHEM 1110, 1111, 1120, 1121 General Chemistry
 PHYS 2010, 2011 Non-Calculus Based Physics I/Physics Problems
 Laboratory I, 4 hours
 PHYS 2020, 2021 Non-Calculus Based Physics II/Physics Problems
 Laboratory II, 4 hours
 ASTR 1030 Exploring the Universe (or ASTR 3400)
 GEOL 1040 Physical Geology

Professional Education Requirements

Students must contact their minor advisor in professional education for approval of appropriate courses. (For specific procedures and additional requirements for teacher licensure, see page 184.)

Major Requirements

Students who want to teach secondary chemistry must complete the Chemistry major in the following manner:

CHEM 1110, 1111, 1120, 1121 General Chemistry
 CHEM 2230 Quantitative Analysis
 CHEM 3010, 3020 Organic Chemistry
 CHEM 4330 Physical Chemical Fundamentals OR
 CHEM 4350 Physical Chemistry
 CHEM 4340 Physical Chemistry Fundamentals OR
 CHEM 4360 Physical Chemistry
 Upper-division chemistry elective to total 36 hours of chemistry.

Teacher Licensure in Interdisciplinary Studies (K-8)

Students may become licensed to teach in K-8 including science by following the Interdisciplinary Studies major. The science and math courses required are PSCI 1030 and 4030; BIOL 1030 and 3000; GEOL 1030; and MATH (1010 or 1710), 1410, 1420, and 4010. See other requirements for majors in the Elementary and Special Education Department section.

Major in Science

The major in Science has two concentrations—General Science and Health Science.

Concentration: General Science

The General Science concentration is a broad-based science degree requiring 19 semester hours acceptable for a minor in each of two fields selected from biology, chemistry, and physics plus 8 semester hours from the third field. Each student should work closely with his/her advisor in completing the program for the General Science concentration. Only one minor is required with the General Science concentration.

Concentration: Health Science

The Health Science concentration is for students who expect to enter a professional school after completing an appropriate pre-professional curriculum. There are two groups of programs. One group leads to an MTSU degree through completion of three years of the program at MTSU, acceptance into a professional school, and successful completion of one year. These programs are referred to as three-and-one programs and result in a bachelor's degree in science from MTSU with a health science concentration. Other programs listed under health science are designed for transfer only and do not lead to a degree from MTSU.

Admission to the MTSU pre-professional program does not assure admission to a professional program. In the beginning of the third year, the student should make application to the program of choice, following the procedures of the particular program. Selection for admission is competitive and is made by the admissions committee of the respective program according to their selection standards.

The limits on class size in most of the professional programs may prevent acceptance of some qualified applicants. In the event a first application is unsuccessful, the program may be easily changed to a Chemistry or Biology major leading to a B.S. degree, and then application may be made a second time.

Students should note the following:

Chemistry—Students with a weak background or no high school chemistry should enroll in CHEM 1010 and 1011 before taking CHEM 1110 and 1111.

Mathematics—Mathematics is not required for entrance into medical school, dental school, pharmacy school, or physical therapy school; however, mathematics is necessary for physics which is required. MATH 1710 and 1720 provide the minimum math preparation; good students are advised to take MATH 1730 and 1910.

Physics—Students with a weak background in physics should take PHYS 1300 prior to taking PHYS 2010.

Irregularities—Advanced placement, remedial courses, failure of required courses, or summer school may cause some students to deviate from the sequence in the recommended curriculum. Regular consultation with the advisor is most important.

Advisors—Advisors to these programs are assigned in the office of the Chemistry Department. The advisor will provide a curriculum sheet as a guide for the program. Guidance is provided on the recommended courses and procedures to be followed in leading to applications to a professional program. A pre-professional evaluation committee aids the students in providing recommendations requested by the professional programs.

Degree from MTSU—Students who plan to obtain degrees from MTSU must file the Intent to Graduate Form.

Three-and-One Programs

The following are programs that lead to an MTSU degree: pre-cytotechnology, pre-dental, pre-medical, pre-medical technology, pre-pharmacy, pre-physical therapy, pre-nuclear medicine technology, and pre-radiation therapy technology.

Since acceptance into dental or medical school after three years is highly competitive, most students complete the specified pre-dental or pre-medical curriculum, then complete a fourth year at MTSU which will lead to a bachelor's degree in biology, chemistry, or science.

General requirements for a degree under this concentration:

1. Complete the specified three-year pre-professional curriculum consisting of at least 99 hours.
2. Apply to, be accepted in, and successfully complete either one year (33 hours) in the professional school or one year of an approved clinical or laboratory school (for which 33 hours will be granted).
3. Each program will require a minimum of 35 hours of science (biology, chemistry, physics).
4. Twenty-four (24) upper-division hours from MTSU of which 12 must be in science as approved by the advisor.

NOTE: Any hours granted for laboratory experience do not apply to these 24 upper-division hours.

5. The last 30 semester hours must be in residence at MTSU.

Pre-cytotechnology Curriculum (CT)

The curriculum outlined for the Medical Technology program may be followed at MTSU; after successful completion of a program in a nationally accredited cytotechnology school, a B.S. degree from MTSU can be received.

Pre-dental Curriculum

The following curriculum is proposed for students planning to enter the College of Dentistry at the University of Tennessee-Memphis and will meet the requirements for a B.S. degree from MTSU upon successful completion of one year in dental school. See page 56 for specific requirements.

NOTE: Many applicants find that a B.S. degree is required to be competitive for acceptance; therefore, most pre-dental students usually pursue a Chemistry major and Biology minor or vice versa.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
CHEM 1110, 1111, 1120, 1121	8	CHEM 3010, 3020	8
BIOL 1110, 1120	8	ENGL 2030, 2--- (Area II-A)	6
ENGL 1010, 1020 (Area I-A)	6	HIST 2010, 2020 (Area III-A)	6
MATH 1710, 1720*	4 or 6	BIOL 3020, 4130	8
PHED or M S (Area V)	2	PHED or M S (Area V)	2
Gen. Studies (Areas I-B, III-B)	6	Gen. Studies (Area II-B)	3
		Electives	3
	34-36		36
JUNIOR			
CHEM 2230	5		
CHEM 3530	4		
PHYS 2010, 2011, 2020, 2021	8		
CSCI 1150	3		
Electives	16		
	36		

*Good math students should take MATH 1730 and 1910 and delay General Studies electives until later semesters; students with a weak background in physics should take PHYS 1300 prior to taking PHYS 2010.

**Additional courses elected must satisfy the requirements for 48 upper-division hours (24 for the three-and-one program); 132 total hours for graduation (99 for the three-and-one program), and for the B.S. degree (but not for the three-and-one program) major and minor. At least one hour of computer science is required.

Pre-medical Curriculum (Including optometry, osteopathy, or chiropractic)

The pre-medical curriculum prepares students to make application to all of the medical schools in Tennessee and most of the medical schools in the United States. A student planning to enter a medical school in another state is expected to supply the advisor with a catalog from the school under consideration. Students who plan to apply for admission to a school of optometry***, osteopathy, or chiropractic should follow this general pre-medical curriculum.

Recommended Curriculum**FRESHMAN**

CHEM 1110, 1111, 1120, 1121	8
MATH 1730*, 1910	8
BIOL 1110, 1120	8
ENGL 1010, 1020 (Area I-A)	6
PHED or M S (Area V)	2
	32

JUNIOR

CHEM 2230	5
CHEM 3530 or 4500	4
CSCI 1150	3
BIOL 3020, 4210	8
HIST 2010, 2020, or 2030 (Area III-A)	6
Gen. Studies (Areas I-B, II-B, and III-B)	9
	35

Students with a weak background in physics should take PHYS 1300 prior to taking PHYS 2010.

*Can substitute MATH 1710 and 1720

**Electives must be selected carefully in order to assure meeting institutional requirements for graduation: (1) completion of General Studies requirements; (2) completion of a minor; (3) completion of a minimum 48 semester hours of upper-division work (courses numbered 3000 and above).

***MATH 1910 and BIOL 2230 required

Pre-medical Technology Curriculum (MT)

The medical technology degree program requires the successful completion of three years (minimum of 99 semester hours) academic work followed by a minimum of 12 months (33 semester hours or equivalent) in a medical technology program approved by a national accrediting agency and by Middle Tennessee State University. The academic program must fulfill all General Studies requirements for a B.S. degree, include at least 24 semester hours of courses numbered 3000 or above, and at least the last two semesters (30 semester hours) must be in residence at MTSU. All other requirements for graduation given elsewhere in this catalog must be met. Specific course requirements are shown below.

Upon approval, a student with the MLT certification from a nationally accredited program at a community college or from any other nationally-accredited MLT program may enroll at MTSU, follow the academic part of the medical technology curriculum, fulfill MTSU requirements for graduation, and receive credit (33 semester hours for programs with credit hours not assigned) for the MLT clinical work to be applied toward the B.S. degree. In addition to appropriate MLT certification, three years of full-time clinical laboratory experience are required, in accordance with state and national regulations.

Recommended Curriculum**FRESHMAN**

ENGL 1010, 1020 (Area I-A)	6
CHEM 1110, 1111, 1120, 1121	8
BIOL 1110, 1120	8
MATH 1710	3
PHYS 1300 (2010/2011)	3-4
PHED or M S (Area V)	2
Gen. Studies (Areas I-B, III-B)	6
	36-37

SOPHOMORE

CHEM 3010, 3020	8
BIOL 2120, 2230	8
PHYS 2010, 2011, 2020, 2021	8
ENGL 2030, 2--- (Area II-A)	6
PHED or M S (Area V)	2
	32

SENIOR

CHEM 4330, 4340	8
BIOL 4130	4
Chemistry, Biology, and General electives**	21
	33

JUNIOR

Chemistry 3530	4
BIOL 4110, 4300, and Biology elective	11-12
Electives*	15-17
CSCI 1150	3
	33-36

*Student should consult advisor for acceptable electives.

FOURTH YEAR: PROFESSIONAL PROGRAM**

Biochemistry (11 semester hours):

Clinical Chemistry

Urinalysis

Special Chemistry

Microbiology (8 semester hours):

Bacteriology

Mycology

Parasitology

Immunohematology (14 semester hours):

Immunology (Serology)

Hematology

Coagulation

Blood Banking

**Specific courses and titles may vary slightly with the different programs. However, the major areas of study are the same and the total course offerings of each affiliated program fulfill the 33 semester-hour requirement.

REGISTRATION PROCEDURE FOR THE FOURTH YEAR

Upper-division forms must have been completed and approved by the dean, College of Basic and Applied Sciences, at the end of the second year. After acceptance to an accredited medical technology program, the student will be considered registered for the professional year when the following procedures are completed:

1. A letter of recommendation is sent from the faculty advisor to the dean, College of Basic and Applied Sciences, stating the name of the program, the program being taken during the senior year, and dates of beginning and completion of the program.
2. Approval is given by the dean, College of Basic and Applied Sciences, of the advisor's recommendation by letter, authorizing the student to attend the program indicated. Copies of the letters are sent to the Records Office, to the advisor, and to the professional program.
3. An Intent to Graduate Form is filed by the student in the Records Office at the beginning of the semester **before** the semester in which graduation is expected.

AFFILIATED MEDICAL TECHNOLOGY PROGRAMS

1. Vanderbilt Medical Center, Program of Medical Technology, Nashville, Tennessee
2. TSU-Meharry, Program of Medical Technology, Nashville, Tennessee

Acceptance of work from non-affiliated schools may also be arranged on an individual student basis.

Pre-pharmacy Curriculum

The following curriculum is proposed for students planning to enter pharmacy school after three years of study at MTSU. Well-prepared students may be able to complete pharmacy admission requirements in two years and should consult with their advisors regarding course selection. The course schedule below meets prerequisites for the Pharm.D. programs at the University of Tennessee at Memphis, Samford University, and Mercer University. Students planning to enter other

schools of pharmacy should consult regularly with their advisors and choose courses required by the particular school.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
CHEM 1110, 1111, 1120, 1121	8	BIOL 1110, 1120	8
MATH 1710, 1720	6	PHYS 2010, 2011, 2020, 2021	8
ENGL 1010, 1020 (Area I-A)	6	MATH 2020	3
Gen. Studies (Area III-A)	6	ENGL 2030, 2--- (Area II-A)	6
PSY 1410	3	COMM 2200 (Area I-B)	3
CSCI 1150	3	PHED 2100 or PHED electives (Area V)	2
PHED or M S (Area V)	2	Social Science elective*	3
	34		33

JUNIOR

CHEM 3010, 3020	8
MATH 1530	3
Gen. Studies (Area II-B)	3
BIOL 2230	4
Upper-division electives	8
Electives	6
	32

Students with a weak background in physics should take PHYS 1300 prior to taking PHYS 2010.

*Psychology, Sociology, Economics, Anthropology, or Political Science

Pre-physical Therapy Curriculum

The following curriculum is proposed for students planning to make application to the physical therapy program in the College of Allied Health Sciences at the University of Tennessee-Memphis and plan to receive their B.S. degree from MTSU after successfully completing the first year (33 credit hours minimum) of physical therapy school. Since different schools have different prerequisites, curriculum guide sheets for this and other PT schools in Tennessee should be obtained from the secretary in DSB 241. At that time, a pre-physical therapy advisor is assigned. Frequent contact with the advisor is essential to being properly prepared for application to the professional schools. Volunteer work in physical therapy is required. A student intending to apply to other schools should obtain admission packets from them and consult with his or her advisor.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
CHEM 1110, 1111 1120, 1121*	8	BIOL 2010, 2020	8
BIOL 1110, 1120	8	PHYS 2010, 2011, 2020, 2021**	8
ENGL 1010, 1020	6	ENGL 2030, 2--- (Area IIA)	6
MATH 1710, 1720 (or 1730)	4-6	HIST 2010, 2020	6
PSY 1410, 2300	6	Social Science***	3
PHED (Area V)	2	PHED (Area V)	2
	34-36		33

JUNIOR

PSY 3020 (or MATH 1530)	3
CSCI 1150 (or INFS 2200)	3
COMM 2200	3
Gen. Studies (Area II-B)	3
Social Science***	6
Upper-division science elective	4
Upper-division electives	10
	32

*Students with a weak background in chemistry should take CHEM 1010 and 1011 before taking CHEM 1110 and 1111.

**Students with a weak background in physics should take PHYS 1300 before taking PHYS 2010.

***UT-M requires 9 hours of social science which should be taken from MTSU General Studies requirements or courses necessary to meet requirements of other PT programs. Some suggested courses are PSY 4190, 4210, 3230, 3590; ANTH 2010; SOC 1010; PHIL 1030, 2110; ECON 2410. Other elective courses should be selected from BIOL 3010, 3020, 4130 or other **approved** biology or chemistry courses. Other suggested elective courses are PHED 4830 and 4910.

Pre-nuclear Medicine Technology

The Nuclear Medicine Technology degree program requires a successful completion of three years (minimum of 99 semester hours) academic work at MTSU followed by a minimum of 12 months (33 semester hours or equivalent) in a nuclear medicine technology program approved by a national accrediting agency and by Middle Tennessee State University. The academic program must fulfill all General Studies requirements for a B.S. degree, include at least 24 semester hours of courses numbered 3000 or above, and at least the last two semesters (junior year, 30 semester hours) must be in residence at MTSU. All other requirements for graduation given elsewhere must be met.

Recommended Curriculum*

FRESHMAN		SOPHOMORE	
ENGL 1010, 1020 (Area I-A)	6	ENGL 2030, 2--- (Area II-A)	6
BIOL 2010**, 2020	8	CHEM 3010, 3020 or 2030, 3530***	8
MATH 1710, 1720	6	PHYS 2010, 2011, 2020, 2021	8
CHEM 1110, 1111 1120, 1121	8	HIST 2010, 2020 (Area III-A)	6
PHED or M S (Area V)	2	HUM 2130	3
Gen. Studies (Areas I-B, II-B)	6	HLTH 3300	3
	36	PHED 2100 (Area V)	2
			36

JUNIOR

BIOL 2230, 3340, 4150, 4300	14
CSCI 1150	3
Gen. Studies (Area III-B)	3
PHYS 3330	3
MATH 1530	3
PSY 4650	3
SOC 4040	3
HLTH 4270	3
	35

*Program illustrates a typical program of study under the health science concentration in which a student completes the three-year Nuclear Medicine Technology program with the fourth year at a nuclear medicine technology school.

***If the student has not had high school biology, BIOL 1110 is strongly recommended before taking BIOL 2010.*

****CHEM 2030 or 3010 and CHEM 3020 or 3530 are required for the University of Tennessee-Knoxville.*

Pre-radiation Therapy Technology Curriculum

The Radiation Therapy Technology degree program requires a successful completion of three years (minimum of 99 semester hours) academic work at MTSU followed by a minimum of 12 months (33 semester hours or equivalent) in a radiation therapy technology program approved by a national accrediting agency and by Middle Tennessee State University. The academic program must fulfill all General Studies requirements for a B.S. degree, include at least 24 semester hours of courses numbered 3000 or above, and at least the last two semesters (junior year, 30 semester hours) must be in residence at MTSU. All other requirements for admission given elsewhere must be met.

Recommended Curriculum*

FRESHMAN		SOPHOMORE	
ENGL 1010, 1020 (Area I-A)	6	ENGL 2030, 2--- (Area II-A)	6
BIOL 2010**, 2020	8	PHYS 2010, 2011, 2020, 2021	8
MATH 1710, 1720	6	HIST 2010, 2020 (Area III-A)	6
CHEM 1110, 1111, 1120, 1121	8	HUM 2130	3
PHED or MS (Area V)	2	HLTH 3300	3
Gen. Studies (Areas I-B, II-B)	6	HLTH 4270	3
	36	N FS 1240	3
		Gen. Studies (Area II-B)	3
			35

JUNIOR

BIOL 2230, 3340, 4150	10
CSCI 1150	3
BIOL 4300	4
PHED 2100 (Area V)	2
Gen. Studies (Area III-B)	3
PHYS 3330	3
MATH 1530	3
PSY 4650	3
SOC 4040	3
HLTH 4280	2
	36

**Program illustrates a typical program of study under the health science concentration in which a student completed the three-year Radiation Therapy Technology program with the fourth year at a radiation technology school.*

***If the student has not had high school biology, BIOL 1110 is strongly recommended before taking BIOL 2010.*

Other Transfer Programs

The following programs do not lead to an MTSU degree: pre-dental hygiene, pre-health information management, and pre-occupational therapy. Students apply to the professional school during the second or third year.

Pre-dental Hygiene Curriculum

The following curriculum is proposed for students planning to make application to the dental hygiene program in the College of Allied Health Sciences at the University of Tennessee-Memphis.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
CHEM 1010, 1011, 1020, 1021	8	BIOL 2010, 2020, 2230	12
BIOL 1110, 1120	8	ENGL 2030, 2---	6
ENGL 1010, 1020	6	COMM 2200	3
SOC 1010, 2010	6	Electives*	6
PSY 1410, 1420	6	PHED or M S	2
PHED or M S	2	HIST 2010, 2020	6
	36		35

**The advisor should be consulted for elective recommendations.*

Pre-health Information Management Curriculum

The following curriculum is proposed for students planning to enter the program of health information management (formerly medical record administration) at the College of Allied Health Sciences at the University of Tennessee-Memphis. The program requires three years of study (90 semester hours minimum) at MTSU followed by one calendar year in Memphis. Successful completion of the entire program will entitle the student to receive a Bachelor of Science degree granted by the University of Tennessee.

Students who plan to apply for admission to other schools of health information management should consult with their advisors.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
BIOL 1110, 1120	8	BIOL 2010, 2020	8
ENGL 1010, 1020	6	ENGL 2030	3
PSY 1410	3	SOC or HIST or ECON	6
Psychology elective	3	COMM 2200	3
MATH 1710	3	PSY 3020	3
PHED	2	HUM 2130	3
Electives	6	PHED	2
	31	Electives	6
			34

JUNIOR*

INFS 2200 or 3100	3
BMOM 3010	3
BLAW 3400	3
BMOM 3510	3
BMOM 4350	3
MGMT 3610	3
Electives	10-12
	28-30

**For admission to University of Tennessee-Memphis, a minimum of fifteen (15) upper-division hours is required. The business courses and statistics courses listed above satisfy this requirement.*

Pre-occupational Therapy Curriculum

The following curriculum is proposed for students planning to enter the occupational therapy program at the College of Allied Health Sciences, University of Tennessee-Memphis. The program requires two years of study (64 semester hours minimum) at MTSU followed by two calendar years at UT-Memphis. Successful completion of the program will entitle the student to receive a Bachelor of Science degree in Occupational Therapy granted by the University of Tennessee.

Students who plan to apply for admission to other schools of occupational therapy should consult with their advisors.

Recommended Curriculum

FRESHMAN		SOPHOMORE	
BIOL 1110, 1120	8	BIOL 2010, 2020	8
ENGL 1010, 1020	6	SOC 1010	3
MATH 1730 or 1710 and 1720	4-6	INFS 2200	3
CHEM 1110*, 1111	4	PHYS 2010, 2011**	4
PSY 1410	3	PSY 2300, 3230	6
COMM 2200	3	HUM 2130	3
PHED	2	PHED	2
Elective***	3	Electives***	2-4
	33-35		31-33

*Students with a weak background in chemistry should take CHEM 1010, 1011 before taking CHEM 1110, 1111.

**Students with a weak background in physics should take PHYS 1300 before taking PHYS 2010 and 2011.

***Suggested electives from anthropology, art, education, history, kinesiology, language, mathematics, music, philosophy, sociology, and theatre.

Minor in Science

The minor in Science consists of 16 semester hours in biology, chemistry, or physics, and 8 semester hours in one of the other two. At least four upper-division hours in a science must be taken at MTSU. Consult your advisor to determine which courses will satisfy minor requirements.

Courses in Chemistry [CHEM]

1010 (111) Introductory General Chemistry. Four credits. For students with no prior courses in chemistry; to be taken before CHEM 1110. Fundamental concepts of chemistry: measurements, matter, chemical bonds, chemical reactions, nuclear chemistry, states of matter, solutions, and electrolytes. Three hours of lecture. Must enroll in a 1011 section in the same semester. Will not count toward a major or minor in Chemistry.

1011 (111L) Introductory General Chemistry Laboratory. Laboratory to accompany CHEM 1010. Must be taken **concurrently** with CHEM 1010.

1020 (112) Introductory General Chemistry. Four credits. Prerequisites: CHEM 1010 and 1011. Topics include hydrocarbons, organic functional groups, isomerism, carbohydrates, lipids, nucleic acids and proteins, enzymes, and metabolism. Three hours of lecture. Must enroll in a 1021 section in the same semester. Will not count toward a major or minor in Chemistry.

1030 Chemistry for Consumers. Four credits. Language, development, structure, and role of chemistry as it relates to the knowledge and activities of the educated person. Examples will be taken from medicine and human health, environmental pollution, energy and its costs, etc. Understanding of the relationship between chemistry and society will be enhanced using special subtopics: lectures, demonstrations, and inquiry-based laboratory work drawing from the expertise of the individual faculty. For non-science majors. Three hours lecture and one two-hour laboratory. **(Does not count toward any major or minor.)**

1021 (112L) Introductory General Chemistry Laboratory. Laboratory to accompany CHEM 1020. Must be taken **concurrently** with CHEM 1020.

1110 (121) General Chemistry. Four credits. Prerequisites: High school chemistry; CHEM 1010 and 1011 or equivalent. Fundamental concepts of atomic structure, molecular structure and bonding, chemical reactions, stoichiometric relationships, periodic properties of the elements, thermochemistry, and properties of gases. Three hours of lecture. Must enroll in a 1111 section in the same semester.

1111 (121L) General Chemistry Laboratory. Laboratory to accompany CHEM 1110. Must be taken **concurrently** with CHEM 1110.

1120 (122) General Chemistry. Four credits. Prerequisites: CHEM 1110 and 1111. Chemical equilibrium, solid and liquid states of matter, chemistry of acids and bases, principles of chemical kinetics, precipitation reactions, elementary thermodynamics, electrochemistry, and nuclear chemistry. Three hours of lecture. Must enroll in a 1121 section in the same semester.

1121 (122L) General Chemistry Laboratory. Laboratory to accompany CHEM 1120. Must be taken **concurrently** with CHEM 1120.

2030 (303) Elements of Organic Chemistry. Four credits. Prerequisites: CHEM 1020 and 1021 or 1120 and 1121. Aspects of organic chemistry fundamental to an understanding of reactions in living organisms. Three hours lecture and one three-hour laboratory.

2230 (222) Quantitative Analysis. Five credits. Prerequisites: CHEM 1120 and 1121. Gravimetric and volumetric determinations, an introduction to optical and electrical methods of analysis, and the stoichiometry of analytical chemistry. Three hours lecture and two three-hour laboratories.

2880 (250) Undergraduate Research I. One to four credits. Prerequisite: Permission of the instructor. Student research allied with the instructor's research or designed specifically for the particular student. Minimum of three clock-hours work per week required for each credit hour. Counts for elective hours toward graduation but does not count for a major or minor in Chemistry. May be repeated for a total of four credits.

2930, 2940 (293, 294) Cooperative Education. Three credits. Provides students with opportunities for on-the-job training in conjunction with on-campus academic experiences. Department chair should be consulted. Pass/Fail.

3010 (321) Organic Chemistry. Four credits. Prerequisites: CHEM 1120 and 1121 or equivalent. Types of carbon compounds, their nomenclature, reactions, and physical properties. Three hours lecture and one three-hour laboratory.

3020 (322) Organic Chemistry. Four credits. Prerequisite: CHEM 3010. A continuation of CHEM 3010. Three hours lecture and one three-hour laboratory.

3180 (324) Organic Chemistry—Laboratory. One credit. Prerequisite: CHEM 3010. Special laboratory techniques involved in the synthesis, isolation, and characterization of organic compounds. One three-hour laboratory.

3530 (325) Principles of Biochemistry. Four credits. Prerequisite: CHEM 2030 or 3020. Structure, properties, and functions of carbohydrates, lipids, and proteins and their reactions in living organisms. Three-hour lecture and one three-hour laboratory.

- 3880 (350) Undergraduate Research II.** One to four credits. Prerequisites: CHEM 2230 and permission of the instructor. Student research allied with the instructor's research or designed specifically for the particular student. Minimum of three clock-hours work per week required for each credit hour. Summary report or some other form of presentation required. A total of no more than four credit hours of CHEM 3880, CHEM 4880, or PSCI 4080 may be counted toward a major in Chemistry. May be repeated for a total of four credits.
- 3890 Chemistry Instruction Internship.** One to three credits. Prerequisites: Successful completion of target courses and permission of instructor. A course to refine thinking, communication, and interpersonal skills through exposure to on-the-spot technical questions and a laboratory teaching experience as an assistant in an introductory chemistry laboratory. Course credits will not count toward a major or minor in Chemistry. May be repeated for a total of three credits.
- 3970, 3980 (397, 398) Cooperative Education.** Three credits. Provides students with opportunities for on-the-job training in conjunction with on-campus academic experiences. Department chair should be consulted. Pass/Fail.
- 4000 (431) Medicinal Chemistry.** Three credits. Prerequisite: CHEM 3010/3020 or CHEM 2030 with permission of instructor. Drug design and development including structural changes involved in making drug analogs. Drug interaction with macromolecular targets including receptors, enzymes, and DNA. Various classes of drugs and their mechanisms for the treatment of specific therapeutic areas.
- 4100 (424) Organic Spectroscopy.** Three credits. Prerequisite: CHEM 3020. Theory of and practice in the interpretation of mass, infrared, Raman, ultraviolet-visible, and nuclear magnetic resonance spectra. Three hours lecture.
- 4230 (423) Instrumental Analysis.** Four credits. Prerequisites: CHEM 2230, 3020, and 4360. Potentiometric titration, polarographic, coulometric, gas chromatographic, ultraviolet, visible and infrared absorption, and atomic absorption techniques of analysis. Requirements and limitations of each technique for obtaining quantitative measurements; applications to various chemical systems from both theoretical and experimental standpoints. Three hours lecture and one three-hour laboratory.
- 4330 (401) Physical Chemistry Fundamentals.** Four credits. Prerequisites: PHYS 2020 and 2021; CHEM 2230; MATH 1910. Basic study of physical chemistry including modern theories of atomic and molecular structure, chemical thermodynamics, electrochemistry, chemical kinetics, and related theoretical topics. Three hours lecture and one three-hour laboratory.
- 4340 (402) Physical Chemistry Fundamentals.** Four credits. Prerequisite: CHEM 4330. A continuation of CHEM 4330. Three hours lecture and one three-hour laboratory.
- 4350 (421) Physical Chemistry.** Four credits. Prerequisites: CHEM 2230; MATH 3310; PHYS 2021 and 2120. Quantitative principles of chemistry involving extensive use of calculus. Thermodynamics, phase changes, chemical equilibria, electrochemistry, reaction kinetics, quantum chemistry, molecule structure, and statistical mechanics. Three hours lecture and one three-hour laboratory.
- 4360 (422) Physical Chemistry.** Four credits. Prerequisite: CHEM 4350. A continuation of CHEM 4350. Three hours lecture and one three-hour laboratory.
- 4400 (416) Inorganic Chemistry.** Three credits. Prerequisites: CHEM 1120 and 1121 or equivalent; CHEM 2030 or 3010 recommended. The basic concepts and theories of inorganic chemistry and how these are used to predict and understand the physical and chemical properties of compounds of the elements other than carbon. Inorganic compounds in the air, water, earth, and in the laboratory and in biochemistry, geochemistry, and industrial materials and processes.
- 4410 (426) Advanced Inorganic Chemistry.** Three credits. Prerequisites: CHEM 3020 and 4400; prerequisite or corequisite: CHEM 4360. Atomic theory for chemical periodicity; symmetry and group theory; molecular orbital theory; coordination, organometallic, and bioinorganic chemistry of the transition metals.
- 4430 (454) Advanced Synthetic Laboratory Techniques.** Two credits. Prerequisite: CHEM 3020. Techniques for synthesis and purification of organic, organometallic, and inorganic compounds. Practice in the measurement of NMR and IR spectra. Skills in library use for research. Four hours laboratory and one-hour lecture.
- 4500 (425) Biochemistry I.** Three credits. Prerequisite/corequisite: CHEM 3020; not open to those who have had CHEM 3530. Chemical properties of biological molecules such as amino acids, proteins, enzymes, and carbohydrates. Chemical basis of enzyme catalysis and reactions of carbohydrate metabolism.
- 4510 (435) Biochemistry II.** Three credits. Prerequisite: CHEM 4500. Structure and metabolism of lipids, amino acids, nucleotides, and nucleic acids at the molecular level. Emphasis on chemistry of metabolic reactions.
- 4530 (445) Biochemical Techniques.** Two credits. Prerequisite/corequisite: CHEM 4500 or consent of instructor. CHEM 2230 recommended. Laboratory in biochemical techniques with emphasis on protein purification, enzyme kinetics, carbohydrate and lipid analysis, and manipulation of DNA. One-hour lecture and four hours laboratory.
- 4580 (439A) Medical Technology Clinical Practicum.** Six credits. Intensive classroom and laboratory studies covering principles and techniques in the areas of clinical chemistry, microbiology, immunohematology, bloodbanking, and related areas. Pass/Fail.
- 4600 (470) Introduction to Environmental Chemistry.** Three credits. Prerequisites: CHEM 1120 and 1121; CHEM 2030 or 3010; CHEM 2230 strongly recommended. Quality of environment and of chemical changes in the environment through contaminations or modification of the air, water, and soil as they are affected by peoples' agricultural, industrial, and social activities. Three hours lecture.
- 4610 (472) Environmental Soil Chemistry.** Three credits. Prerequisites: CHEM 2230 and 3020. Fundamental chemical principles applied to the fate and behavior of organic and inorganic contaminants in the soil-water environment. An overview of the soil medium; will include both the mineral component and the soil organic matter. Interaction between solid and liquid components introduced, followed by contaminant reactions between the phases, including sorption and redox reactions.
- 4630 (471) Detection of Chemical Pollutants.** Four credits. Prerequisites: CHEM 2230 and one semester of organic chemistry or consent of instructor. Theory and practice of analytical chemistry methods used in pollution measurement. Three hours lecture and one three-hour laboratory.

- 4700 (428) Polymers, an Introduction.** Three credits. Prerequisite: CHEM 3020; physical chemistry strongly recommended. Chemistry of polymers; their structure, properties, and applications. Three hours lecture.
- 4730 (429) Advanced Physical Chemistry.** Four credits. Prerequisite: CHEM 4360 or permission of instructor. Modern chemical concepts as applied to the areas of thermodynamics, electrochemistry, and chemical kinetics. Three hours lecture and one three-hour calculation laboratory.
- 4780 (400) Polymer and Materials Chemistry Laboratory.** One credit. Prerequisite: Organic chemistry; physical chemistry strongly recommended. Laboratory introduction to synthesis, kinetics, characterization, engineering, and applications of polymers and other modern materials. To be taken concurrently with CHEM 4700.
- 4800 (415) Technical Writing for Chemists.** One credit. Prerequisite: Completion of undergraduate English requirements. Emphasis on improving communication skills using writing exercises. Students will develop writing skills necessary to transmit technical information effectively, construct persuasive proposals and resumes, and produce clearly written reports of laboratory results.
- 4880 (450) Research.** Four credits. Prerequisites: 24 hours of ACS-approved chemistry courses. Student research allied with the instructor's research or designed specifically for the particular student. Minimum of twelve (12) hours a week. Student must write a formal report which is approved by the instructor to receive credit for this course.

Courses in Chemical Instrumentation Techniques [CHEM]

- 3080 (306) Liquid Chromatographic Techniques.** One credit. Prerequisite: CHEM 2230 or consent of instructor. Techniques involving the use of liquid, column, paper, thin-layer, and ion-exchange chromatography for the purpose of purifying and/or separating compounds.
- 3090 (307) Techniques of Gas Chromatography.** One credit. Prerequisite: CHEM 2230 or consent of instructor. Principles, techniques, and applications of gas chromatography. Selection of column materials, packing of columns, and types of detectors. Separation of mixtures of hydrocarbons, drugs, and pesticides.
- 3280 (308) Ultraviolet-visible Spectrophotometry.** One credit. Prerequisite: CHEM 2230 or consent of instructor. Techniques used in obtaining ultraviolet and visible spectra and in using these data for analytical determination.
- 4090 (405) Infrared Spectrophotometry.** One credit. Prerequisites: CHEM 3010 and 3020 or 2030. Techniques involving the use of infrared spectrophotometers to aid in the detection and identification, both qualitative and quantitative, of organic molecules. Sample preparation—mulls, liquids, gases, and solids.
- 4190 (408) Mass Spectrometry.** One credit. Prerequisite: CHEM 2230 or consent of instructor. Mass spectrographic analysis emphasizing the use of the instrument in obtaining mass spectral data. Technique of obtaining spectra using gas chromatographic effluents as well as normal sampling procedures. Routine maintenance and an introduction to the interpretation of simple spectra.

- 4280 (406) Atomic Absorption Analysis Techniques.** One credit. Prerequisite: CHEM 2230 or consent of instructor. Laboratory study of atomic absorption spectrophotometry emphasizing the use of the instrument in making analytical measurements. Research instrumentation, flame, and non-flame techniques.
- 4380 (407) Nuclear Magnetic Resonance Experimental Methods.** One credit. Prerequisite: CHEM 3020 or 2030. NMR measurements, operation of the spectrometer, and evaluation of the quality of spectra produced.

Courses in General Physical Science [PSCI]

- 1030 (100) Topics in Physical Science.** Four credits. Language, development, structure, and role of physical science (physics, chemistry, astronomy, and geology) as it relates to the knowledge and activities of the educated person. For non-science majors. Three hours lecture and one two-hour laboratory. **(A General Studies course [Area IV-A]. Does not count toward any major or minor.)**
- 4030 (442) Experimental Physical Science.** Four credits. Prerequisite: PSCI 1030. Basic concepts, laws, and principles of astronomy, chemistry, geology, and physics with particular emphasis on the utilization of equipment available or easily improvised in actual school situations to illustrate these concepts, laws, and principles.
- 4080 (400) Problems in Physical Science.** Four credits. Prerequisite: Consent of instructor. A problem from chemistry, physics, or other physical science appropriate to the student's background and interest. A formal written report must be submitted and approved by the instructor to receive credit for this course.

Honors College

In addition to the above courses, the Department of Chemistry offers the following courses in Honors: CHEM 1110 and 1120 and PSCI 1030. See current class schedule and Honors information in this catalog.

Graduate Study

The Department of Chemistry offers the Master of Science and Doctor of Arts degrees. The Graduate Catalog has degree requirements and course listings.

