College of Science

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The mission of the College of Science is threefold: to prepare students for careers in the natural or physical sciences, mathematics, computer science, engineering, or technology; to provide general scientific and mathematical backgrounds for non-science majors; and to prepare students for advanced training in professional or graduate schools. To accomplish its mission the College maintains an academic atmosphere conducive to excellence in teaching and research and enforces high standards of performance for faculty and students.

To ensure an understanding of basic scientific concepts, the College offers extensive opportunities for student participation. Students gain experience in laboratories, interact with the environment through field studies, conduct undergraduate research, and train in technologically advanced instrumentation. A combination of student participation, rigorous classroom instruction, and library research gives majors a competitive advantage in career advancement or in the selection of professional or graduate colleges. The non-science major is assured of adequate scientific knowledge to make informed decisions essential to citizens in a science-oriented, technological world.

The seven academic units in the College of Science are the Departments of Biology, Chemistry and Biochemistry, Computer Science, Mathematics, Physics, and Engineering Technology, as well as the Ingram School of Engineering.

Three departments offer both the Bachelor of Arts (BA) and Bachelor of Science (BS) degrees. The Department of Engineering Technology offers a Bachelor of Science in Technology (BST) degree.

The Ingram School of Engineering and the Departments of Biology and of Chemistry and Biochemistry offer a Bachelor of Science degree. Majors include applied mathematics, aquatic biology, biochemistry, chemistry, computer science, electrical engineering, engineering technology, general biology, industrial engineering, industrial technology, manufacturing engineering, mathematics, microbiology, physics, and wildlife biology. In addition, pre-professional programs of study are available in architecture, dentistry, medicine, and pharmacy. Secondary teacher certification may be incorporated into some of the majors.

Academic Advising Center

The College of Science Undergraduate Academic Advising Center provides current students with advising on academic and administrative issues. Students are informed about matters related to academic general education core requirements, scholarships and awards within the College, the selection of an appropriate major and minor, the selection of appropriate courses, transfer and correspondence courses, academic probation/suspension, the choice of an educational program leading to a bachelor's degree, and participation in pre-professional programs. The Advising Center is a resource for current students who are considering a science major or pre-professional program, and provides assistance for students applying for graduation. Career counseling is available in the academic unit of the student's major.

Science Teacher Certification

Currently, there are six Texas Grades 8-12 science certifications: Chemistry (BS in Chemistry) Computer Science (BA or BS in Computer Science), Life Sciences (BS in Biology), Mathematics (BA or BS in Mathematics), Physical Science (BS in Chemistry), and Technology (BST in Industrial Technology). Students seeking any of these certifications need to follow coursework leading to a degree in the appropriate science field, in addition to taking the required certification courses. This information can be found

within each departmental section of the catalog. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student.

Students interested in certification are strongly encouraged to see the Science Advisor early in their undergraduate program or certification process.

Department of Biology

Supple Building 384
T: 512.245.2178 F: 512.245.8713
www.bio.txstate.edu

Degree Programs Offered

BS, major in Biology
BS, major in Biology (with Life Science Teacher Certification)
BS, major in Biology – Aquatic Biology
BS, major in Biology – Microbiology
BS, major in Biology – Wildlife Biology (leading to certification as a wildlife biologist)

Minor Offered

Biology

Biology is the study of living systems and how they function. Because the biological sciences have had and will have profound impact on human society in all areas-longevity, environmental quality, ethics of biotechnology-knowledge of the biological sciences is an essential aspect of higher education.

Biologists find employment in research laboratories, regulatory agencies, or education. Interested students should see the major area advisors.

Biology majors take a minimum of 11 courses that include the core curriculum of Functional Biology, Organismal Biology, Genetics, a diversity course, a physiology course, Ecology, and Evolution. At the sophomore level and above, a variety of courses in molecular and organismal biology assure a broad education in any of the regions of specialization. Additional required courses in chemistry, mathematics and physics provide a broad scientific background. A minor outside the Biology Department is required for all areas of study except for the Wildlife Biology program The BS in Biology is often the choice for those seeking pre-medical and pre-dental education.

Teacher Certification

Students may earn the Life Science (Texas Grades 8-12) certification through a BS in Biology. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student. Students interested in certification are strongly encouraged to see the Science Advisor early in their undergraduate program or certification process.

For students who are seeking teacher certification within their major and are not in the College of Science, but would like a second teaching field in Life Science (Texas Grades 8-12) the requirements are: BIO 1430, 1431, 2410, 2450, 4408, 4416 or 4454; CHEM 1341/1141, 1342/1142.

Bachelor of Science
Major in Biology
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Choose one Advanced Physiology course from: BIO 3421 (fall or spring), 3465 (fall), or 4441 (spring).
5. BIO 4299 requires faculty and departmental chair approval to count toward the 15 hours of advanced BIO electives. Biology advanced electives cannot include: BIO 3351, 4305, 4402, 4403, and 4408.
6. Recommended minor is chemistry or biochemistry. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 1430	4	BIO 1431	4	BIO 2450	4	BIO 2400, 2410, or 2411	4
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	ENG 1320	3	MATH 2321	3	MATH 2331	3
ENG 1310	3	HIST 1310	3	HIST 1320	3	ART, DAN, MU, or TH 2313	3
POSI 2310	3	PFW one course	1			POSI 2320	3
PFW one course	1						
Total	16	Total	15	Total	14	Total	17

Junior Year 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 4416	4	BIO Advanced Physiology (see gen. req. 4)	4	BIO Advanced Electives (see gen.		BIO 4301	3
PHYS 1410	4	PHYS 1420	4	req. 1 & 5)	8-9	BIO Advanced Electives (see gen. req.	
COMM 1310	3	ENG Literature (see gen. req. 2)	3	Minor/Advanced Electives (see		1 & 5)	6-7
PHIL 1305	3	Social Science component (see gen. req. 2)	3	gen. req. 1 & 6)	7-8	Minor/Advanced Electives (see gen.	
						req. 1 & 6)	2-3
						Electives (see gen. req. 6)	2
Total	14	Total	14	Total	15-17	Total	13-15

Bachelor of Science
Major in Biology
(with Life Science Teacher Certification)
Minimum required: 129 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. BIO 4408 does not count toward a non-teacher certification program in Biology.
5. Choose two courses from the following with advisor approval: BIO 3308, 3406, 4410, 4420, 4421, 4422, 4425, 4434, 4446, 4454 or 4465.
6. A Secondary Education minor is required.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 1430	4	BIO 1431	4	BIO 2450	4	BIO 2410	4
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	ENG 1320	3	MATH 2321	3	MATH 2331	3
ENG 1310	3	HIST 1310	3	PHYS 1410	4	PHYS 1420	4
POSI 2310	3	Social Science component (see		ENG Literature (see gen. req. 2)	3	PFW one course	1
PFW one course	1	gen. req. 2)	3				
Total	16	Total	17	Total	18	Total	16

Sophomore Year - Summer I		Sophomore Year - Summer II		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
PHIL 1305	3	ART, DAN, MU, or TH 2313	3	BIO 2400 or 2411	4	BIO Advanced Elective (see gen. req. 5)	3
HIST 1320	3	POSI 2320	3	CI 3325	3	COMM 1310	6-7
				BIO 4416	4	BIO Advanced Elective (see gen. req. 5)	2-3
				CI 4332	3	ENG 3303	2
Total	6	Total	6	Total	14	Total	13-15

Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr
CI 4370	3	EDST 4681	6
BIO 4408 (see gen. req. 4)	4		
CI 4343	3		
RDG 3323	3		
BIO 4301	3		
Total	16	Total	6

Bachelor of Science
Major in Biology-Aquatic Biology
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. BIO 4299 requires faculty and departmental chair approval to count toward the advanced electives. Biology advanced electives cannot include: BIO 3351, 4305, 4402, 4403, and 4408.
5. Recommended minor is chemistry or biochemistry. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 1430	4	BIO 1431	4	BIO 2450	4	BIO 2411	4
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	ENG 1320	3	MATH 2321	3	MATH 2331	3
ENG 1310	3	HIST 1310	3	HIST 1320	3	ART, DAN, MU, or TH 2313	3
POSI 2310	3	PFW one course	1			POSI 2320	3
PFW one course	1						
Total	16	Total	15	Total	14	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 3421 or 3465	4	BIO Advanced Elective (see gen. req. 4)	3	BIO 4415	4	BIO 4301	3
PHYS 1410	4	PHYS 1420	4	BIO 3460	4	BIO 4416	4
COMM 1310	3	ENG Literature (see gen. req. 2)	3	BIO 4470	4	Minor/Advanced Electives (see	
PHIL 1305	3	Social Science component (see gen. req. 2)	3	Minor/Advanced Electives		gen. req. 1 & 5)	4
		Minor/Advanced Electives (see gen. req. 1 & 5)	3-4	(see gen. req. 1)	2-3	Electives (see gen. req. 5)	2
Total	14						
		Total	16-17	Total	14-15	Total	13

Bachelor of Science
Major in Biology-Microbiology
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Sixteen hours of advanced BIO electives are required of which 12 hours must be chosen from: BIO 3442 (fall), 4426 (spring), 4445 (fall), 4446 (spring), or 4447 (spring).
5. BIO 4447 can only be used to satisfy the physiology requirement or the advanced microbiology course requirement, but not both.
6. Recommended minor is chemistry or biochemistry. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 1430	4	BIO 1431	4	BIO 2450	4	BIO 2400	4
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	ENG 1320	3	MATH 2321	3	MATH 2331	3
ENG 1310	3	HIST 1310	3	ART, DAN, MU, or TH 2313	3	POSI 2320	3
POSI 2310	3	PFW one course	1	HIST 1320	3		
PFW one course	1						
Total	16	Total	15	Total	17	Total	14

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO Advanced Elective (see gen. req. 4)	8	BIO 4441 or 4447 (see gen. req. 4 & 5)	4	BIO Advanced Electives (see gen. req. 1, 4, & 5)	4	BIO 4416	4
PHYS 1410	4	BIO Advanced Electives (see gen. req. 1, 4, & 5)	4	Minor/Advanced Electives (see gen. req. 6)	7-8	BIO 4301	3
PHIL 1305	3	PHYS 1420	4	Social Science component (see gen. req. 2)	3	Minor/Advanced Electives (see gen. req. 1 & 6)	1-2
		COMM 1310	3			ENG Literature (see gen. req. 2)	3
						Electives (see gen. req. 6)	2
Total	15	Total	15	Total	14-15	Total	13-14

Bachelor of Science
Major in Biology-Wildlife Biology
(leading to certification as a wildlife biologist)
Minimum required: 133 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Choose one Advanced Physiology course from: BIO 3421 (fall or spring), 3465 (fall), or 4441 (spring).

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 1430	4	BIO 1431	4	BIO 2450	4	BIO 2411	4
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2130, 2330	4	PHYS 1410	4
US 1100	1	ENG 1320	3	MATH 2321	3	MATH 2331	3
ENG 1310	3	HIST 1310	3	ART, DAN, MU, or TH 2313	3	ENG Literature (see gen. req. 3)	3
POSI 2310	3	PFW one course	1	HIST 1320	3	POSI 2320	3
PFW one course	1						
Total	16	Total	15	Total	17		
						Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Junior Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
BIO 2410	4	BIO Advanced Physiology (see gen. req. 4)	4	PHIL 1305	3	BIO 4420	4
BIO 4410	4	BIO 3461	4	Social Science component (see gen. req. 3)	3		
BIO 4416	4	BIO 4421	4				
COMM 1310	3	ENG 3303	3				
Total	15	Total	15	Total	6	Total	4

Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr
BIO 4304	3	BIO 4301	3
BIO 4422	4	BIO 4425	4
BIO 4423	4	BIO 4435	4
MATH 2328 or HP 3302	3	GEO 4338	3
Total	14	Total	14

Minor in Biology

A minor in Biology includes: BIO 1430, 1431, 2450, and 9 advanced BIO hours, not to include BIO 3351, 4299, 4305, 4402, 4403, or 4408. CHEM 1341, 1141 and 1342, 1142 are prerequisites for BIO 2450. A grade of "C" or higher is required in all prerequisite courses.

Courses in Biology (BIO)

BIO 1320 and 1421 may be taken in any order. BIO 1320 and 1421 will not meet the requirements for medical or dental schools.

1320 (BIOL 1308) Modern Biology I, Molecules, Cells, and Physiology. (3-0) Provides students with basic scientific and biological principles. Current problems in biology and the ethics of science are presented with perspectives of public policy from a scientific viewpoint. This course, when accompanied by BIO 1421, will fulfill the Natural Science Core Component. This course is not recommended for majors in the natural sciences, including biology.

1421 (BIOL 1409) Modern Biology II, Organisms, Evolution, and Environment. (3-3) This course provides the non-science major the strong and diverse background necessary to understand the structural and functional diversity of organisms, evolution and behavior, and interactions among organisms and their environment. Topics include issues such as the genetic basis of behavior, overpopulation and extinction, ozone depletion, and conservation biology. This course is not recommended for majors in the natural sciences, including biology.

1430 (BIOL 1406) Functional Biology. (3-3) Provides the science major with a strong foundation in cellular and molecular biology and physiology. Topics include biological chemistry, metabolism, the molecular bases of cellular functions and genetics, the molecular biology of reproduction and development, cell signaling, neurobiology and the special senses, and human physiology and the immune system. Not recommended for non-majors.

1431 (BIOL 1407) Organismal Biology. (3-3) Provides the science major with a strong foundation in organismal biology, Mendelian and population genetics, evolution, and ecology. Topics include taxonomy, patterns of diversity, ecosystems and human biology, behavior, reproductive biology, and comparative physiology. Not recommended for non-majors.

2400 (BIOL 2421) Microbiology. (3-3) Principles of microbiology, morphology, anatomy, physiology and taxonomy of representative groups of non-pathogenic organisms. Laboratory methods stress studies of pure cultures, the use of laboratory apparatus in quantitative determinations and the detection and identification of microbial populations in the environment. Prerequisites: BIO 1430, 1431, and CHEM 1341 with a grade of "C" or higher.

2410 Intermediate General Botany. (3-3) An introduction to the biology of plants and plant-like organisms, emphasizing their role in ecosystem processes, relationships between structure and function, and the evolutionary relationships among the major plant groups. Prerequisites: BIO 1430 and 1431 with a grade of "C" or higher.

2411 Intermediate Zoology. (3-3) Provides biology majors a strong foundation in animal biology at the organismal level. The format will include details of animal form and function as well as concepts relating to classification, phylogeny, evolution, and ecology. Topics will include natural history, biogeography, adaptations to local environments, shared characters, and behavior. All material is presented in an accepted phylogenetic sequence. Prerequisites: BIO 1430 and 1431 with a grade of "C" or higher.

2430 (BIOL 2404) Human Physiology and Anatomy. (3-4) A course on human physiology covering the various organ systems. Principles of molecular biology, cell and tissue structure, anatomy and relationship of structure and function are stressed. May not be credited toward a Biology major or minor.

2440 (BIOL 2420) Principles of Microbiology. (3-3) The Basic Principles of microbiology, morphology, physiology, immunology and the relationship of microorganisms to diseases. This course is designed primarily to meet the requirements for students in allied health sciences and other programs requiring only one semester of microbiology. This course may not be credited toward a biology major or minor.

2450 (BIOL 2416) Genetics. (3-3) An introduction to basic principles of Genetics by studies of Mendelian, molecular, quantitative and population genetics. Topics include: classical transmission genetics, and gene mapping, DNA replication and repair, transcription, translation, control of gene expression, genetic engineering techniques, Hardy-Weinberg equilibrium, evolutionary change via natural selection, and genetic drift. Prerequisites: BIO 1430, 1431; CHEM 1141, 1341, 1142, and 1342 with grades of "C" or higher.

2451 Human Anatomy and Physiology I. (3-2) Part I of a two semester course on the structure and function of the human body. Designed specifically to prepare students for nursing and other health professions. Prerequisites: CHEM 1141 and 1341 with grades of "C" or higher.

2452 Human Anatomy and Physiology II. (3-2) Part II of a two semester course on the structure and function of the human body. Designed specifically to prepare students for nursing and other health professions. Prerequisites: CHEM 1141 and 1341 with grades of "C" or higher.

3300 Cell and Molecular Biology. (3-0) Fundamentals of structure and function of prokaryotic and eukaryotic cells. Course includes cell and organelle structure, basic biochemistry, principles of thermodynamics and energy transformation, nucleic acid and protein synthesis, enzyme kinetics, cell motility and cell signaling. Prerequisites: BIO 1430 and CHEM 1342 with grades of "C" or higher, or permission of instructor.

3308 Global Ecology. (3-0) An interdisciplinary introduction to the science of global environmental change. Emphasis will be placed on understanding principles of earth system science, the scientific basis underlying the major components of global environmental change, the linkages between these components, and the central role of humanity in contributing to the observed changes. Prerequisites: BIO 1430, 1431 with a grade of "C" or higher. (MC) (WI)

3351 Forensic and Human Genetics. (3-0) An introduction to basic principles of Mendelian, molecular, and forensic genetics as it relates to the problems of human populations.

This course is intended for non-science majors. May not be credited towards a biology major or minor. Prerequisites: BIO 1320 and 1421 or BIO 1430 and 1431.

3370 The Biology of Marine Mammals. (3-0) This course will examine the evolution, behavior, and physiological adaptations (morphological, sensory, energetic, reproductive, and communicative) of the major groups of marine mammals: cetaceans, pinnipeds, and siennas. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher. (WI)

3406 Economic Botany. (3-3) An introduction to the utilization of plants by humans and their economic and ecological significance. Laboratories will stress plant features beneficial to economic and societal needs. Prerequisite: BIO 2450 with a grade of "C" or higher.

3410 Phycology. (3-3) A study of algal organisms, comparative and culture techniques. Prerequisites: 8 hours from BIO 1410, 2410, 2450, 3400, 3450 with a grade of "C" or higher.

3421 Vertebrate Physiology. (3-3) The study of the physiology of vertebrate organ systems, including the nervous system, musculoskeletal system, endocrine system, cardiovascular system, respiratory system, digestive system, reproductive system and urinary system. Mammalian systems will be emphasized. Prerequisites: BIO 2450 with a grade of C or higher.

3422 Biological Oceanography. (3-3) This course examines chemical and physical aspects of oceans and estuaries as they relate to biological oceanography, specifically primary and secondary productivity, energy flow, and adaptations of marine organisms. Two field trips are taken to the Gulf Coast of Texas. Prerequisites: BIO 2450, 2410 or 2411 with a grade of "C" or higher; GEO 3335. (WI)

3430 Mycology. (3-3) A study of the fungal kingdom including slime molds and lichens. Laboratory studies will emphasize taxonomy, morphology and culture techniques. Prerequisites: BIO 2410 or 2400, 2450 with a grade of "C" or higher.

3442 Virology. (3-4) The structure, multiplication and genetics of bacterial, plant, and animal viruses. The role of viruses in human and plant disease. Prerequisites: BIO 2400, 2450 with a grade of "C" or higher. (WI)

3460 Aquatic Biology. (3-3) An introduction to plant and animal life in the fresh water habitats of the local area. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher; one year of Chemistry. (WI)

3461 Plant Taxonomy. (3-3) Principles of identification and classification of plants; nomenclature and characteristics of various plant groups with emphasis on the higher plants. Prerequisites: BIO 2410, 2450 with a grade of "C" or higher.

3465 Plant Physiology. (3-3) Basic principles of plant physiology studied in lecture and laboratory. Prerequisites: BIO 2450 with a grade of "C" or higher or consent of instructor. One semester of organic chemistry is strongly recommended.

3470 Invertebrate Zoology. (3-4) A study of the comparative morphology, evolution, systematics and natural history of invertebrates. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

3480 Histology. (3-4) A study of the structural and functional relationships between cells and tissues in organs. The laboratory includes the study of prepared slides and of microtechnique. This course is designed to meet the needs of pre-professional students. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

3490 Principles of Developmental Biology. (3-3) This course will cover basic principles of developmental biology in both plant and animal systems. Course will mainly address cell, molecular and genetic mechanisms underlying the development of model organisms. Prerequisites: BIO 1430 and 2450.

4299 Undergraduate Research. (0-4) Supervised individual research projects in a mentor-student relationship with a biology professor. Available only to biology majors with junior standing and at least a "B" average. May be repeated once for credit. Prerequisites: BIO 2450 with a grade of "C" or higher and consent of the supervising professor.

4300 Neurobiology. (3-0) This course will give students an overview of neuroscience, particularly the areas of neuroanatomy, neurophysiology, and evolutionary and developmental neurobiology. Prerequisite: BIO 2450 with a grade of "C" or higher. (MC)

4301 Evolution. (3-0) Basic genetic principles applied to natural selection, adaptation, populations, speciation and man's future. Consideration is given to the origin of life, nature of chromosomal variation, evolution of genetic systems and certain other selected topics. Prerequisite: BIO 2450 with a grade of "C" or higher.

4304 Wildlife and Recreation: Impact, Policy, and Management. (3-0) Students will be introduced to the impact human recreational activities have on wildlife habitats and populations. Management practices to enhance human-wildlife encounters or to minimize detrimental effects on wildlife populations will be presented. Prerequisite: BIO 4416.

4305 Nature Study. (3-3) A comprehensive survey of natural events. Includes laboratory and field work emphasizing observation, collection and discovery of relationships. Creditable only for those seeking elementary certification. Required for those seeking grade 4-8 Science and Mathematics/Science certification.

4306 Population Genetics. (3-0) Examines the fundamental mathematical models used by population geneticists and the theory underlying them, emphasizing modern genetic approaches. Prerequisite: BIO 2450 with a grade of "C" or higher.

4350 Special Topics in Biology. (3-0) Selected advanced topics in biology. May be repeated for credit. Prerequisites will be determined by topic and faculty offering the course.

4350A Cell Biology of Cancer. (3-0) A study of the cell signaling pathways and molecular genetics of cancer, including hands-on participation in ongoing research. Prerequisite: permission of instructor.

4350B Biological Implications of Water Planning in Texas. (3-0)

4350C Field Ornithology. (3-0)

4350D Watershed Management Frameworks and Applications. (3-0)

4350E Techniques in Aquatic Biology. (3-0) This course will provide hands on experience with a suite of physical, chemical, and biological sampling techniques and gear used in applied river studies. Students will be exposed to the fundamentals of data quality objectives, accuracy, precision, detection limits, data visualization, exploratory analysis, univariate and multivariate statistics.

4350F Conservation of Biological Resources. (3-0) This course is an introduction to the protection and sustainable use of

populations, species, habitats, and ecosystems. Course also includes study of the methods used to analyze biodiversity and population regulation. Prerequisites: BIO 4416 or concurrent enrollment.

4369 Biosystematics. (3-0) Biological systematics is a multidisciplinary component of most biological disciplines. Course topics include: classification schemes, homology, homoplasy, the application of nomenclature, and phylogeny reconstruction. The course will also present relevant issues in conservation, biodiversity cataloguing, museum and collection management, and identification methods/dichotomous keys. Prerequisite: BIO 2450 with a grade of "C" or higher.

4402 Earth Science I. (3-3) The description and interpretation of earth phenomena considered from the standpoint of meteorology and astroscience. Includes field observations, methods of measurement and interpretation of data related to the physical environment and space technology. May not be counted toward a major or minor in biology. Required for those seeking grade 4-8 Science and Mathematics/Science certification.

4403 Earth Science II. (3-3) The description and interpretation of earth phenomena considered from the standpoint of geology and oceanography. Includes field observations, methods of sampling and interpretation of data related to the physical environment. May not be counted toward a major or a minor in biology. Required for those seeking grade 4-8 Science and Mathematics/Science certification.

4408 Science Processes and Research. (3-3) Students will analyze research design, design research, interpret data, and communicate results. Stress on broad-field structure and integration of major science concepts and science knowledge. Should be taken the semester prior to student teaching. Required for those seeking 8-12 Life Sciences and Science teacher certification. May not count as one of the four upper-level Biology courses required of general Biology majors, or one of the three upper-level Biology courses required of Biology minors.

4410 Field Biology of Plants. (3-3) Ecological relationships and natural history of plants, including historical geology, geography, soils, vegetational regions and surface geology of central Texas. Emphasis is placed on plant-soil-water relationships to develop conservation concepts. Students will make a representative collection of plants. Prerequisite: BIO 2450 with a grade of "C" or higher.

4411 Morphology of the Vascular Plants. (3-3) The structure, life-cycles and evolution of fossil and living vascular plants. Emphasis on such topics as the origin of land plants, evolution of the ovule, angiospermy, the flower and fruit. Prerequisites: BIO 2450 with a grade of "C" or higher; one year of Chemistry.

4412 Plant Anatomy. (3-3) The anatomy of vascular plants stressing descriptive, development and comparative aspects of seed plants and the anatomical adaptations of plants to environmental factors. Prerequisites: BIO 2450 with a grade of "C" or higher; one year of Chemistry.

4413 Parasitology. (3-4) The biology and biological significance of the common parasites of man and animals. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4415 Ichthyology. (3-3) An introduction to the morphology, taxonomy, natural history and evolution of fishes. Field trips will be made to collect specimens and laboratory periods will be devoted to morphological and systematic analysis. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4416 General Ecology. (3-3) The ecological relationships that exist between organisms and those relationships that exist between organism and environment. Laboratory sessions will be devoted to literature review and/or specific ecological problems. This course or BIO 4454 is required of all biology majors. Prerequisites: BIO 2450; BIO 2410, 2411, or 2400 with a grade of "C" or higher. (WI)

4420 Natural History of the Vertebrates. (3-3) Environmental relationships and natural history of vertebrates. Emphasis is upon taxonomy, speciation and biotic provinces. The laboratory will include field trips for the study and collection of animals in their natural habitats. Students will assemble a representative collection of animals. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher. (WI)

4421 Ornithology. (3-3) Introduction to anatomy, behavior, ecology and identification of birds of Texas. Laboratory will emphasize field studies of birds and their habitat requirements. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4422 Mammalogy. (3-3) The taxonomy, distribution, ecology, behavior and evolution of mammals with particular emphasis on wild animals of the southwest. Laboratory will emphasize anatomy, identification, preparation of specimens and field exercises in the methods of population analysis. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher. BIO 4416 is also recommended.

4423 Wildlife Management. (3-3) Applications of the principles of ecology and natural history to the management of wildlife habitats and control of wildlife populations. Laboratory will involve demonstrations and practice exercises with wildlife management techniques and instrumentation and field trips to observe wildlife management projects. Prerequisites: BIO 2410, 2411, and 2450 with a grade of "C" or higher. BIO 4416, 4421, or 4422 is also recommended. (WI)

4425 Biometry. (3-3) Basic principles of statistical methods as applied to biological problems such as sampling techniques, analysis of data, experimental design and population dynamics. Emphasis will be on practical application. Prerequisites: BIO 2450 with a grade of "C" or higher; MATH 1315.

4426 Immunology. (3-4) A study of the immune response, antigen/antibody reactions, major histocompatibility complex, and immunopathology. Prerequisites: BIO 2400, 2450 with a grade of "C" or higher. One semester of organic chemistry is recommended. (WI)

4434 Herpetology. (3-3) A course treating the origin and evolution of amphibians and reptiles; their reproductive and physiological tactics; taxonomy/systematics; and population biology. Emphasis will be placed on North American species and those groups inhabiting Texas. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4435 Techniques in Wildlife Management. (3-3) The basic methodology of practical wildlife management. This involves techniques in monitoring and data collection related to population dynamics and habitat parameters of wildlife species. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4441 Cellular Physiology. (3-3) Advanced cellular biology,

including membrane physiology, thermodynamics, energy transduction and distribution, and cellular movement in non-muscle and muscle cells. Laboratory includes discussion of current research and exercises in cellular physiology. Prerequisites: BIO 2450 with a grade of "C" or higher; one semester of Organic Chemistry. (WI)

4442 Experimental Techniques. (3-3) Use of methods and instruments applicable to biological investigations, including colorimetry; UV-spectrophotometry; fluorescence; flame and atomic absorption spectrophotometry; paper, gas, gel filtration and ion exchange chromatography; radioactive counting; and electrophoresis. Prerequisite: BIO 2450 with a grade of "C" or higher.

4445 Pathogenic Microbiology. (3-4) Pathogenic bacteria and their relationship to disease, emphasizing identification of selected groups of pathogens, epidemiology and the biological basis for resistance. Prerequisites: BIO 2400, 2450 with a grade of "C" or higher. (WI)

4446 Microbial Ecology. (3-4) This course will illustrate the wide variety of bacteria in nature, their interactions with other organisms and the environments, and their roles in global cycling of elements such as carbon, nitrogen, and sulfur. The laboratories will feature enrichments for selected groups of microorganisms (sulfate reducers, nitrogen fixers) and analysis of these isolates by microscopy, gas chromatography and radiochemical substrate utilizations. Prerequisites: BIO 2400, 2450 with a grade of "C" or higher. (WI)

4447 Microbial Physiology and Genetics. (3-3) This course will cover fundamental concepts in bacterial physiology and genetics, including central and specialized metabolism, and unique aspects of bacterial genetics. Prerequisites: BIO 2400, 2450; CHEM 2142, 2342 with a grade of "C" or higher. (WI)

4450 Physiological Ecology of Animals. (3-3) This course brings together the principal concepts of environmental physiology of animals inhabiting the major ecological realms of the earth (land, air, sea, and fresh water). The biological problems associated with living in the various ecological realms will be discussed, and the biochemical and physiological adaptations of animals to their diverse habitats will be studied. Prerequisite: BIO 2450 with a grade of "C" or higher.

4454 Plant Ecology. (3-3) Physiological ecology and community structure and function in the organization of terrestrial plant ecosystems. Quantitative vegetational sampling and the use of field and laboratory physiological equipment are included in the laboratory. This course or BIO 4416 is required of all Biology majors. Prerequisite: BIO 2450 with a grade of "C" or higher. (WI)

4464 Vertebrate Anatomy. (3-3) This course is a comparative study of vertebrate anatomy. Fossil histories are evaluated to understand how vertebrate radiation occurred in the geological past, along with changes in structure of organs and organ systems. Lab includes dissection of representative members of each major vertebrate group. Prerequisite: BIO 2450. (MC) (WI)

4465 General Entomology. (3-3) Principles of morphology, physiology and taxonomy of insects. Laboratory time will be devoted to a taxonomic study of the common orders and families of insects. Prerequisites: BIO 2411, 2450 with a grade of "C" or higher.

4470 Limnology. (3-3) The physical, chemical, and biological factors affecting productivity in lakes, ponds, and streams. Limnological sampling methods, chemical, and biological analysis of samples and hydrographic surveying are included in the laboratory. Prerequisites: BIO 2450 with a grade of "C" or higher; one year of chemistry. (WI)

4472 Animal Behavior. (3-3) This course presents all the major facets of the study of animal behavior, giving special attention to its evolution and ecological significance. We will discuss major conceptual models guiding past and present research in the field. Laboratories will emphasize experimental techniques and statistical analysis. Prerequisites: BIO 2450; BIO 2400, 2410, or 2411 with a grade of "C" or higher. (WI)

4480 Cytology and Microtechnique. (3-3) A study of cellular structure and microscopic technique. The lecture portion of the course presents cytology of all cell types and theoretical aspects of microscopy including light and electron-based technologies. The laboratory portion of the course provides training in standard light and electron microscopy, laser scanning confocal microscopy, and digital microscopy. Prerequisite: BIO 2450 with a grade of "C" or higher.

4481 Internship in Biological Laboratory Technologies. (0-15) The student will participate in the work of a selected biology unit (private, commercial, or governmental). A research paper, reporting the internship experience conducted at the biological unit under the supervision of a faculty member, will be required. This course may be credited toward a biology major with prior approval of the biology department adviser and chair. Prerequisite: BIO 2450 with a grade of "C" or higher.

Courses in General Science (GS)

3310 General Science. (3-2) A laboratory course designed to acquaint the student with the fundamentals of chemistry and earth space science. Non-creditable for science majors. A required course for Elementary EC-4 Generalist certification, grades 4-8 Science certification, and grades 4-8 Mathematics/Science certification. Prerequisites: PHYS 1310, 1320, and 1110 or PHYS 1410, 1420 completed with a grade of "C" or higher.

3320 General Science. (3-2) A laboratory course designed to acquaint the student with the fundamentals of biological science. Non-creditable for science majors. A required course for Elementary EC-4 Generalist certification, grades 4-8 Science certification, grades 4-8 Mathematics/Science certification. Prerequisite: BIO 1320, 1421, 1430, or 1431 completed with a grade of "C" or higher.

Department of Chemistry and Biochemistry

Chemistry Building 238
T: 512.245.2156 F: 512.245.2374
www.txstate.edu/chemistry

Degree Programs Offered

BS, major in Biochemistry
BS/MS, major in Biochemistry
BS, major in Chemistry
BS, major in Chemistry (with Teacher Certification)
BS, major in Chemistry (with Physical Science Teacher Certification)
BS/MS, major in Chemistry

Minors Offered

Biochemistry
Chemistry

Chemistry is the central science and the study of chemistry provides the essential knowledge needed to address many of society's most pressing needs, such as feeding, clothing, and housing the peoples of the world; tapping new sources of energy; improving health and conquering disease; providing renewable substitutes for dwindling resources; strengthening our national security; and monitoring and protecting our environment. Basic research in chemistry will help future generations address their evolving needs and ensure a higher quality of life.

Chemists and biochemists can work in almost any field and find careers in teaching, research, production, quality control, technical services, and/or sales. Graduates from the Department of Chemistry and Biochemistry have an excellent record of job placement in industrial, academic, and government positions. Many also seek advanced degrees or pursue careers in medicine, dentistry, or pharmacy.

Chemistry and biochemistry majors gain skills in quantitative thinking and problem solving. Majors can work as laboratory instructors for lower division courses or as research assistants in faculty research laboratories. Students often participate in internships and research programs both on and off campus during the summer. The faculty, facilities, library holdings, and chemistry curriculum of the Department of Chemistry and Biochemistry have been accredited by the American Chemical Society. Recipients of a B.S. in Chemistry or B.S. in Biochemistry, who have fulfilled the minimum requirements for professional chemists, are awarded certificates by the American Chemical Society. Receipt of the ACS certificate is recommended as preparatory training for work in industry or for continued graduate studies in chemistry or biochemistry.

Students seeking a BS in Chemistry begin their studies taking foundation courses in chemistry, physics and mathematics. After completion of the foundation courses, students take advanced courses and laboratories in physical chemistry, analytical chemistry, inorganic chemistry and organic chemistry. A minor is required for this degree.

Students seeking a BS in Biochemistry begin their studies taking foundation courses in chemistry, biology, physics and mathematics. After completion of the foundation courses, students take advanced courses and laboratories to gain knowledge and experience in the modern techniques of biochemistry and molecular genetics. A minor is required for this degree.

Qualified chemistry or biochemistry majors completing their junior year of chemistry courses who plan to pursue advanced studies have the opportunity to complete both a BS and MS degrees with one additional year of course work and research after receipt of a BS degree. Students must be active in undergraduate research prior to their senior year to be eligible for the program.

Pharmacy

Pharmacy is a six-year program, two years of which may be taken at Texas State. The six pharmacy schools in Texas (The University of Texas at Austin, University of Houston, Texas Southern University, Texas A&M Health Science Center, Texas Tech University Health Science Center, and University of the Incarnate Word) all require two years of prerequisite courses in chemistry, biology, math, physics, English, humanities and social sciences, but the exact courses required vary by school. Consequently, it is imperative that pre-pharmacy students consult with an advisor prior to and during their pre-pharmacy program. For more information contact the Department of Chemistry and Biochemistry pre-pharmacy advisor.

Teacher Certification

Students may earn either a Chemistry or Physical Science (Texas Grades 8-12) certification in Texas Grades 8-12 while pursuing a BS in Chemistry. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student. Students interested in certification are strongly encouraged to see the Science Advisor early in their undergraduate program or certification process.

For students who are seeking teacher certification within their major and are not in the College of Science, but would like a second teaching field in Chemistry (Texas Grades 8-12) the requirements are: CHEM 1341/1141, 1342/1142, 2341/2141, 2342/2142, 3410, 4295, and 4375.

Bachelor of Science
Major in Biochemistry
Minimum required: 120 semester hours

General Information:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Two semesters of CHEM 4299 are highly recommended and required for the optional certification of the degree as approved by the American Chemical Society.
5. Minor and electives should be chosen in consultation with the departmental or academic advisor. Recommended minor is biology.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
BIO 1430	4	BIO 1431	4	MATH 2472	4	BIO 2450	4
US 1100	1	MATH 2471	4	PHYS 1430	4	PHYS 2425	4
ENG 1310	3	ENG 1320	3	ENG Literature (see gen. req. 5)	3	COMM 1310	3
PHIL 1305 or 1320	3					PFW one course	1
Total	15	Total	15	Total	15	Total	16

Junior Year 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3380	3	CHEM 4360	3	CHEM 4385	3
CHEM 3375	3	CHEM 3275	2	CHEM 4481	4	CHEM 4482	4
BIO 2400	4	HIST 1320	3	Minor Advanced Elective (see gen. req.		Minor Advanced Elective (see gen.	
HIST 1310	3	POSI 2320	3	1 & 5)	4	req. 1 & 5)	4
POSI 2310	3	Social Science Component (see gen. req. 2)	3	Minor Advanced Elective (see gen. req.		ART, DAN, MU, or TH 2313	
		PFW one course	1	1 & 5)	3		3
Total	16	Total	15	Total	14	Total	14

Bachelor of Science and Master of Science
Major in Biochemistry
(Early-Entry Combined program)
Minimum required: 154 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required for the BS degree. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then enough additional hours to total the minimum 124 hours required for the degree will fulfill this requirement. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Students should consult a departmental or academic advisor before selecting an undergraduate minor. A minor in biology is recommended.
5. Students completing 124 semester hours will be eligible for graduation with a BS degree. The MS degree will be awarded only after the completion of all required courses and the successful defense of a research thesis.
6. The graduate-level courses taken in the senior year are CHEM 5110, 5395, 5399A, and a 3-hour elective approved by the graduate advisor. After admission to the Graduate College, 20 additional graduate hours (including a research thesis) and successful completion of a comprehensive examination is required for the MS degree.
7. Students may be admitted to the MS program without entrance qualification exams if they have a 3.00 GPA or higher in all chemistry and biochemistry courses, have completed CHEM 3275, 3380, and two semesters of CHEM 4299, have taken the Graduate Record Exam, and have been accepted by a graduate thesis advisor. Applicants will be evaluated by the Gradate Evaluation Committee to determine their suitability to enter the program. The application process is the same as for other graduate applicants to the Graduate College. Graduate status is provisional until the BS degree is awarded. The BS degree will be certified as approved by the American Chemical Society.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
BIO 1430	4	BIO 1431	4	MATH 2472	4	BIO 2450	4
US 1100	1	MATH 2471	4	PHYS 1430	4	PHYS 2425	4
ENG 1310	3	ENG 1320	3	ENG Literature (see gen. req. 2)	3	COMM 1310	3
PHIL 1305 or 1320	3					PFW one course	1
Total	15	Total	15	Total	15	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Junior Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3380	3	HIST 1310	3	HIST 1320	3
CHEM 3375	3	CHEM 3275	2	POSI 2310	3	POSI 2320	3
CHEM 4299	2	CHEM 4299	2				
BIO 2400	4	Minor Advanced Elective (see gen. req. 1 & 4)		Total	6		6
Minor Advanced Elective (see gen. req. 1 & 4)		Social Science Component (see gen. req. 2)	4			Total	
		PFW one course	3				
	4		1				
Total		Total					
	16		15				

Senior Year - 1st Semeser		Senior Year - 2nd Semester		Fifth Year - 1st Semester		Fifth Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 4360	3	CHEM 4385	3	CHEM 5110	1	CHEM 5110	1
CHEM 4481	4	CHEM 4482	4	Graduate level CHEM Electives	6	Graduate level CHEM electives	6
Minor Advanced Elective (see gen. req. 1 & 4)	3	ART, DAN, MU, or TH 2313	3	CHEM 5370	3	CHEM 5399B	3
CHEM 5110	1	CHEM 5399A	3				
CHEM 5395	3	Graduate level CHEM Elective	3				
Total	14	Total	16	Total	10	Total	10

Bachelor of Science
Major in Chemistry
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. CHEM 4299 must be taken twice for credit and is required for certification of the degree as approved by the American Chemical Society.
5. Students should consult a departmental or academic advisor before selecting a minor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	ENG 1320	3	MATH 2472	4	PHYS 2425	4
COMM 1310	3	HIST 1310	3	PHYS 1430	4	ART, DAN, MU, or TH 2313	3
ENG 1310	3	MATH 2471	4	ENG Literature (see gen. req. 2)	3	PHIL 1305 or 1320	3
POSI 2310	3	PFW one course	1			Electives (see gen. req. 1 & 5)	3
PFW one course	1						
Total	15	Total	15	Total	15	Total	17

Junior Year 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3340	3	CHEM 4331	3	CHEM 4341	3
CHEM 3410	4	CHEM 3245	2	CHEM 4231	2	CHEM 4241	2
HIST 1320	3	POSI 2320	3	CHEM 4375	3	CHEM Advanced Elective (see gen. req. 4)	3-4
Elective (see gen. req. 1 & 5)	3	Social Science Component (see gen. req. 2)	3	Minor Advanced Elective (see gen. req. 1 & 5)	3	Electives (see gen. req. 1 & 5)	3
Minor Advance Elective (see gen. req. 1 & 5)	3	Minor Advance Elective (see gen. req. 1 & 5)	3	Electives (see gen. req. 1 & 5)	3	Electives (see gen. req. 1 & 5)	2-3
Total	16	Total	14	Total	14	Total	14

Bachelor of Science
Major in Chemistry
(with Chemistry Teacher Certification)
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. CHEM 4299 must be taken twice for credit and is required for certification of the degree as approved by the American Chemical Society.
5. A minor in Secondary Education is required.
6. Minor and electives should be chosen in consultation with the departmental or academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Freshman Year - Summer I		Freshman Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
MATH 2471	4	MATH 2472	4				
US 1100	1	PHYS 1430	4				
ENG 1310	3	ENG 1320	3				
PHIL 1305 or 1320	3						
Total	15	Total	15	Total	4	Total	4

Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester		Sophomore Year - Summer I		Sophomore Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3340	3	HIST 1310	3	HIST 1320	3
CHEM 3410	4	CHEM 3245	2	POSI 2310	3	POSI 2320	3
PHYS 2425	4	ART, DAN, MU, or TH 2313	3				
ENG Literature (see gen. req. 2)	3	COMM 1310	3				
		PFW one course	1				
Total	14	Total	12	Total	6	Total	6

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 4331	3	CHEM 4341	3	Social Science Component (see gen. req. 2)	3	EDST 4681	6
CHEM 4231	2	CHEM 4241	2	CI 4370	3		
CHEM 4375	3	CHEM Advanced Elective (see gen. req. 4 & 6)	3-4	CI 4343	3		
CI 4332	3	CI 3325	3	RDG 3323	3		
CHEM 4295	2	Electives (see gen. req. 1, 3, & 6)	0-1	PFW one course	1		
Total	13	Total	12	Total	13	Total	6

Bachelor of Science
Major in Chemistry
(with Physical Science Teacher Certification)
Minimum required: 133-134 semester hours

General Information:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. CHEM 4299 must be taken twice for credit and is required for certification of the degree as approved by the American Chemical Society.
5. A double minor in Secondary Education and Physics is required.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Freshman Year - Summer I		Freshman Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
MATH 2471	4	MATH 2472	4				
US 1100	1	PHYS 1430	4				
ENG 1310	3	ENG 1320	3				
PHIL 1305 or 1320	3						
Total	15	Total	15	Total	4	Total	4

Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester		Sophomore Year - Summer I		Sophomore Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3340	3	HIST 1310	3	HIST 1320	3
CHEM 3410	4	CHEM 3245	2	POSI 2310	3	POSI 2320	3
PHYS 2425	4	PHYS 2435	4				
ART, DAN, MU, or TH 2313	3	Social Science Component (see gen. req. 2)	3				
		COMM 1310	3				
Total	14	Total	15	Total	6	Total	6

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 4331	3	CHEM 4341	3	ENG Literature (see gen. req. 2)	3	CHEM 4295	2
CHEM 4231	2	CHEM 4241	2	CI 3325	3	CI 4370	3
CHEM 4375	3	CHEM Advanced Elective (see gen. req. 4)	3-4			CI 4343	3
CI 4332	3	PHYS 3411	4			RDG 3323	3
PHYS 4320 or 4321	3	PHYS 3312	3			PFW one course	1
PFW one course	1						
Total	15	Total	15-16	Total	6	Total	12

Senior Year - 2nd Semester	
Course	Hr
EDST 4681	6
Total	6

Bachelor of Science and Master of Science
Major in Chemistry
(Early-Entry Combined program)
Minimum required: 150 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required for the BS degree. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then enough additional hours to total the minimum 120 hours required for the degree will fulfill this requirement. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. The graduate-level courses taken in the senior year are CHEM 5110, 5395, 5399A, and a 3-hour elective approved by the graduate advisor. After admission to the Graduate College, 20 additional graduate hours (including a research thesis) and successful completion of a comprehensive examination is required for the MS degree.
5. Students should consult a departmental or academic advisor before selecting an undergraduate minor or electives.
6. Students completing 120 semester hours will be eligible for graduation with a BS degree. The MS degree will be awarded only after the completion of all required courses and the successful defense of a research thesis.
7. Students may be admitted to the MS program without entrance qualification exams if they have a 3.00 GPA or higher in all CHEM courses, have completed two semesters of CHEM 4299, have taken the Graduate Record Exam, and have been accepted by a graduate thesis advisor. Applicants will be evaluated by the Gradate Evaluation Committee to determine their suitability to enter the program. The application process is the same as for other graduate applicants to the Graduate College. Graduate status is provisional until the BS degree is awarded. The BS degree will be certified as approved by the American Chemical Society.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	CHEM 2141, 2341	4	CHEM 2142, 2342	4
US 1100	1	MATH 2471	4	MATH 2472	4	PHYS 2425	4
ENG 1310	3	ENG 1320	3	PHYS 1430	4	ART, DAN, MU, or TH 2313	3
POSI 2310	3	HIST 1310	3	ENG Literature (see gen. req. 2)	3	COMM 1310	3
PHIL 1305 or 1320	3	PFW one course	1			Electives (see gen. req. 1 & 3)	2
PFW one course	1						
Total	15	Total	15	Total	15	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Junior Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 3330	3	CHEM 3340	3	HIST 1310	3	POSI 2320	3
CHEM 3410	4	CHEM 3245	2	Electives (see gen. req. 1 & 3)	3	Electives (see gen. req. 1 & 3)	3
CHEM 4299	2	CHEM 4299	2				
Electives (see gen. req. 1 & 3)	3	Social Science Component (see gen. req. 2)	3				
Minor Advanced Elective (see gen. req. 1 & 5)	3	Minor Advanced Elective (see gen. req. 1 & 5)	3				
Total	15	Total	13	Total	6	Total	6

Senior Year - 1st Semester		Senior Year - 2nd Semester		Fifth Year -1st Semester		Fifth Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 4331	3	CHEM 4341	3	CHEM 5110	1	CHEM 5110	1
CHEM 4231	2	CHEM 4241	2	Graduate level CHEM Electives	6	Graduate level CHEM Electives	6
CHEM 4375	3	Electives (see gen. req. 1 & 3)	3	CHEM 5370	3	CHEM 5399B	3
Minor Advanced Elective (see gen. req. 1 & 5)	3	CHEM 5399A	3				
CHEM 5110	3	Graduate level CHEM Elective	3				
CHEM 5395	1						
Total	15	Total	14	Total	10	Total	10

Minor in Chemistry

A minor in Chemistry requires CHEM 1141 and 1341, 1142 and 1342, 2141 and 2341, 2142 and 2342, 3410, and one advanced course with a minimum of 3 advanced hours, not to include CHEM 4299.

Minor in Biochemistry

A minor in Biochemistry requires CHEM 1141 and 1341, 1142 and 1342, 2141 and 2341, 2142 and 2342, 3276, 3375, and 4360 or 4385.

Courses in Chemistry (CHEM)

1141 (CHEM 1111) General Chemistry Laboratory I. (0-3) First of two laboratory courses in general chemistry for science-related majors. Course introduces the students to the basics of experimental measurements, including density, separation techniques, formula determinations, titrations, thermodynamics, gas laws, and descriptive chemistry. Prerequisite or Co-requisite: CHEM 1341 or CHEM 1310.

1142 (CHEM 1112) General Chemistry Laboratory II. (0-3) Second of two laboratory courses in general chemistry. Laboratory techniques are emphasized, and applied to both qualitative and quantitative analysis. Prerequisites: CHEM 1341, 1141. Prerequisite or Co-requisite: CHEM 1342.

1310 (CHEM 1305) Introductory Chemistry for Non-Science Majors. (3-0) A one semester principles courses for students in non-science related majors. Course covers the major concepts of chemistry and the role of chemistry in contemporary society. Students will not receive credit for both CHEM 1310 and CHEM 1341. Must be followed by CHEM 1430 for general education credit.

1341 (CHEM 1311) General Chemistry I. (3-0) Initial lecture course in general chemistry for science-related majors, covering atomic and molecular structure, bonding, states of matter, solutions, and descriptive chemistry. Concurrent registration in CHEM 1141 is recommended. Prerequisite: Mathematics ACT score of at least 24 (SAT 500 or SAT re-centered 520) or MATH 1315 with a grade of "C" or higher.

1342 (CHEM 1312) General Chemistry II. (3-0) Second of two lecture courses in general chemistry for science-related majors, covering equilibrium processes, acid-base chemistry, and kinetics, and electrochemistry. A basic knowledge of algebra is needed. Concurrent enrollment in CHEM 1142 is recommended. Prerequisite: CHEM 1341 with a grade of "C" or higher.

1430 (CHEM 1407) Chemistry for Non-Science Majors. (3-3) A one semester course which surveys organic and biochemistry and may include petro-chemistry, nuclear chemistry, synthetic and natural polymers. Prerequisite: CHEM 1310 or 1341.

2130 Laboratory Technique in Organic Chemistry. (0-3) An optional laboratory to accompany CHEM 2330, covers experimental techniques of preparation, purification, and determination of physical and chemical properties of organic compounds. Prerequisites: CHEM 1342/1142. Co-requisite: CHEM 2330.

2141 (CHEM 2123) Organic Chemistry Laboratory I. (0-3) This laboratory introduces the student to the general techniques of organic chemistry. Prerequisites: CHEM 1342 with a grade of "C" or higher, CHEM 1142. Prerequisite or Co-requisite: CHEM 2341.

2142 (CHEM 2125) Organic Chemistry Laboratory II. (0-3) This laboratory involves the study of typical organic reactions. Prerequisites: CHEM 2341 with a grade of "C" or higher, CHEM 2141. Prerequisite or Co-requisite: CHEM 2342.

2150 Biochemistry & Metabolism Lab. (0-3) An optional laboratory to accompany CHEM 2350. This laboratory examines the physical properties and chemistry of carbohydrates, amino acids, proteins, lipids and nucleotides. Course is designed for students majoring in nutrition, clinical laboratory science and agriculture. Prerequisites: CHEM 2330/2130 or 2342/2142. Co-requisite: CHEM 2350.

2330 Fundamentals of Organic Chemistry. (3-0) A one-semester course which covers nomenclature, structure and reactions of organic compounds with an introduction to bioorganic molecules. Course is designed for students majoring in nutrition, clinical laboratory sciences and agriculture. Prerequisites: CHEM 1342/1142.

2341 (CHEM 2323) Organic Chemistry I. (3-0) This course covers the nomenclature, reactions and reaction mechanisms of the hydrocarbons and the alkyl halides. Prerequisites: CHEM 1342 with a grade of "C" or higher. Pre- or Co-requisite: CHEM 1142.

2342 (CHEM 2325) Organic Chemistry II. (3-0) This course covers the nomenclature, reactions and reaction mechanisms of the major functional groups. Prerequisite: CHEM 2341 with a grade of "C" or higher. Prerequisite or Co-requisite: CHEM 2141.

2350 Biochemistry & Metabolism. (3-0) A one-semester study of carbohydrate, proteins, lipids and nucleotides which presents both structure and intermediary metabolism along with an introduction to the function of enzymes and coenzymes. Course is designed for students majoring in nutrition, clinical laboratory science and agriculture. Prerequisites: CHEM 2330/2130 or CHEM 2342/2142.

2390 Environmental Chemistry. (3-0) Environmental chemistry examines sources, reactions, transport and fate of chemical entities in the environment, as well as their effects on human health and the natural environment. This multidisciplinary subject draws from such fields as geology, physics, toxicology, limnology, water-treatment and chemistry. Prerequisites: CHEM 1342/1142.

3245 Physical Chemistry Laboratory. (1-4) Experiments illustrating principles and methods of physical chemistry are performed. Written reports on the experiments are prepared. Prerequisites: CHEM 3330, 3410. Prerequisite or Co-requisite: CHEM 3340. (WI)

3275 Biochemical Techniques. (1-4) Course introduces biochemistry majors to the fundamental techniques used in modern biochemistry. Course emphasizes essential techniques employed in the study of biomolecules, the use of modern instrumentation, and manipulation, analysis, and reporting of experimental data. Prerequisites: CHEM 3375 with a grade of "C" or higher. (WI)

3276 Experimental Biochemistry. (1-4) Course introduces biochemistry minors to the fundamental techniques used in modern biochemistry. Experiments use the essential techniques employed in the study of proteins, enzymes and nucleic acids

with emphasis on the use of modern instrumentation and the manipulation and analysis of experimental data. Prerequisites: CHEM 3375 with a grade of "C" or higher.

3330 Physical Chemistry I. (3-0) The course covers principles of thermodynamics and thermochemistry, phase equilibria, electrochemistry and elementary kinetics including rate laws and mechanisms. Prerequisites: CHEM 1142; CHEM 1342 and MATH 2472 with a grade of "C" or higher.

3340 Physical Chemistry II. (3-0) The course covers kinetics, quantum mechanics, spectroscopy, and other selected topics. Prerequisites: CHEM 3330; MATH 2472 with a "C" or better; and PHYS 2425 with a grade of "C" or higher.

3375 Principles of Biochemistry. (3-0) Course provides biochemistry majors and minors with a rigorous introduction to biochemistry. Topics include the chemical function and structure of proteins, nucleic acids, lipids and carbohydrates; enzyme mechanisms, kinetics and regulation. Students may not receive credit for both CHEM 3375 and CHEM 4375. Prerequisites CHEM 2342 with a grade of "C" or higher.

3380 Physical Methods in Biochemistry. (3-0) This course is designed to acquaint the student with the chemical and physical principles of modern biochemical methods. Emphasis is placed upon the application of the methods to current problems in biochemistry and molecular biology and the interpretation of data. Prerequisite: CHEM 3375 with a grade of "C" or higher.

3410 Quantitative Analysis. (3-6) Course covers the general theory and practice of typical methods of gravimetric and volumetric analysis, satisfies the quantitative analysis requirements for chemistry majors, minors, pre-medical and pharmacy students. Prerequisites: CHEM 1342 with a grade of "C" or higher, CHEM 1142.

4231 Advanced Laboratory I. (2-4) An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of organic and inorganic materials. Prerequisites: CHEM 3245, 3340, 3410. Prerequisite or Co-requisite: CHEM 4331. (WI)

4241 Advanced Laboratory II. (2-4) An advanced integrated lab illustrating a variety of chemical techniques for the preparation, characterization and analysis of inorganic and organic materials. Prerequisites: CHEM 4331, 4231. Prerequisite or Co-requisite: CHEM 4341. (WI)

4295 Laboratory Development and Practice. (1-2) This course develops the laboratory instructional abilities of students seeking either 8-12 Chemistry or 8-12 Physical Science Teaching Certification. Topics include both traditional laboratory techniques and guided inquiry techniques, safety, laboratory management, pedagogical theory and practical knowledge of laboratory experiments. Prerequisite: Junior standing and an overall GPA of 2.5 or higher.

4299 Undergraduate Research. (0-4) This course is available to undergraduate chemistry or biochemistry majors only. It may be repeated but a maximum of four semester hours from this course are applicable toward the Bachelor of Science degree. Prerequisite: Permission of department.

4331 Instrumental Analysis. (3-0) The theory and methodology associated with the quantitative analysis of materials, i.e., electronics, spectroscopy, electrochemistry and chromatography are presented. Prerequisite: CHEM 3340.

4333 Spectroscopy. (3-0) The study of various spectrometric techniques in qualitative and structural analysis of chemical substances. Prerequisite: CHEM 2342 with a grade of "C" or higher.

4341 Advanced Inorganic Chemistry. (3-0) Chemical bonding, coordination chemistry compounds, acid-base concepts, and other topics are included along with some descriptive chemistry. Prerequisite: CHEM 3340.

4350 Modern Molecular Modeling. (3-0) A study of the application of computational techniques to molecular modeling. Topics covered include quantum mechanical modeling, forcefield based molecular modeling, molecular energy minimization, molecular dynamics, vibrational spectra, solution of crystalline structures, diffraction patterns, molecular blends, phase equilibria, crystal morphology, physical property prediction and mesoscale modeling. Prerequisite: CHEM 3340.

4351 Introduction to Polymers. (3-0) This course is designed to develop the student's general understanding of polymer history and importance as well as terminology, structure, and synthesis. The overall scope of the course will be to develop the student's general knowledge of polymer synthesis and structure. Prerequisite: CHEM 2342 with a grade of "C" or higher.

4360 Advanced Biochemistry and Molecular Biology. (3-0) This course provides Biochemistry majors and minors with advanced knowledge of the field of molecular biochemistry. Topics include gene expression (transcription and translation of genes in bacteria and higher organisms), post-translational modification of proteins, chromosomal DNA replication, cell cycle checkpoint controls, DNA damage and repair, as well as theories of cancer and aging. Prerequisite: CHEM 3375.

4371 Directed Study. (3-0) Independent study on a particular subject area in chemistry. The specific study area, resource material, goals, and achievements will be approved by the instructor. May be repeated once for additional credit. Prerequisites: CHEM 2142/2342, 3410, and permission of instructor.

4375 Biochemistry. (3-0) Course provides Chemistry majors and minors with an overview of biochemistry topics. Topics include a description of the structure and function of proteins, enzymes, nucleic acids, lipids and carbohydrates. Students may not receive credit for both CHEM 3375 and CHEM 4375. Prerequisites CHEM 2342 with C or better.

4385 Metabolism. (3-0) A study of the biodegradation and biosynthesis of carbohydrates, lipids, amino acids, proteins, and nucleic acids. Prerequisite: CHEM 2342 with a grade of "C" or higher. (MP)

4390 Supramolecular Chemistry. (3-0) This course is designed to be a survey of the nature of non-covalent interactions between host and guest species. Emphasis will be focused on the rational design of hosts, themodynamic and kinetic parameters involved in binding and the applications of various binding/recognition phenomena. Prerequisite: CHEM 2342 with a grade of "C" or higher.

4481 Advanced Biochemistry Lab I. (2-8) The first of two laboratory courses providing instruction in the modern techniques of biochemistry. Experiments are performed on the isolation, manipulation and characterization of DNA, RNA and proteins. Students will prepare formal written reports and oral presentations. Prerequisites: CHEM 3275 with a grade of "C" or higher; CHEM 3380. (WI)

4482 Advanced Biochemistry Lab II. (2-8) The second of two laboratory courses providing instruction in the modern techniques of biochemistry. Experiments are performed on the isolation, manipulation and characterization of DNA, RNA, and proteins. Students will use their results and the scientific literature to prepare formal written reports and oral presentations. Prerequisite: CHEM 4481. (WI)

Department of Computer Science

Nueces Building, Room 247
T: 512.245.3409 F: 512.245.8750
www.cs.txstate.edu

Degree Programs Offered

BA, major in Computer Science
BA, major in Computer Science (with Teacher Certification)
BS, major in Computer Science
BS, major in Computer Science
(with concentration in Computer Engineering)
BS, major in Computer Science (with Teacher Certification)

Minor Offered

Computer Science

Certificate Offered

Computer Science

Mission Statement

The Department of Computer Science mission is to advance the knowledge of computer science and technology through education, research, and service for the betterment of industry, government, and society.

Vision Statement

The department seeks to become a competitive doctoral-granting department and to expand its depth and breadth in the research and study of applied computing.

Computer Science Goals

1. Graduating students with strong technical backgrounds and communication skills.
2. Graduating students who understand the values and requirements of responsible professionalism and lifelong learning.
3. Building a sustainable research program.
4. Developing international visibility for our research.
5. Providing quality service to the university, the profession, and the community.

Overview

The Department of Computer Science offers two degree options for students—a Bachelor of Arts (BA) or a Bachelor of Science (BS). The Bachelor of Science degree program in Computer Science is accredited by the Computing Accreditation Commission of ABET, Inc.

The department offers courses in computer architecture, data structures and algorithms, automata theory, compilers, operating systems, object-oriented design and implementation, Web programming, software engineering, computer graphics, computer networks, distributed systems, computer security, digital forensics, database design, data mining, machine learning, human computer interaction, artificial intelligence, and several programming languages including C, C++, Java, Assembly, LISP, HTML, Perl, PHP, and JavaScript.

Computer Science graduates can further their studies in graduate schools or seek employment in industry, such as, hardware manufacturing; software development; computer applications in the petroleum, aerospace, and chemical industries; and secondary school teaching.

Certificate in Computer Science

Additionally, for persons who already hold a baccalaureate degree, the department offers a Certificate in Computer Science. Refer to the Texas State graduate catalog for more information.

Secondary Teacher Certification

Students may pursue teacher certification in Computer Science for Texas public schools grades 8-12 through a BA or BS degree. Students interested in certification are strongly encouraged to see an academic advisor early in their undergraduate program or certification process. A student also may elect initial or additional certification as a post-baccalaureate or graduate student. Post-baccalaureate students should contact the Office of Educator Preparation for initial consultation. Students seeking initial teacher certification must complete 21 hours of the professional sequence courses under the College of Education: CI 3325, CI 4332, CI 4370, CI 4343, RDG 3323, and EDST 4681 (Student Teaching).

Admission to Teacher Education

Students who want to be certified to teach in Texas accredited schools should follow the curriculum sequence outlined by their major departments or colleges. The students should contact an academic advisor who will help plan schedules that will lead to graduation as well as certification. Students are encouraged to join student organizations related to the teaching profession.

The following criteria must be satisfied for admission to any teacher education program:

1. Junior standing (minimum 60 hours completed)
2. An overall Texas State GPA of 2.50 or higher
3. Texas Higher Education Assessment (THEA) scores of at least 220 in writing, and 230 in reading and mathematics or documentation of exemptions or equivalencies
4. Completion of the mathematics and science formative assessments
5. College level skills in reading, oral and written communication, critical thinking, and mathematics
    - Reading: Successful completion of PHIL 1305/1320 or its equivalent

- o Oral Communication: Successful completion of COMM 1310 or its equivalent
- o Written Communication: Grades of C or higher in ENG 1310 and 1320 or their equivalents
- o Critical Thinking: Successful completion of PHIL 1305/1320 or its equivalent
- o Mathematics: Successful completion of the mathematics requirement in the selected major (MATH 1317 or 1319 or 2417 or 2471)

Second Teaching Field in Computer Science

For students who are seeking teacher certification in their major but would like a second teaching field in Computer Science for Texas public schools (grades 8-12), the requirements are: CS 1308, 1428, 2308, 2318, 3358, and 12 hours CS electives of which 9 hours must be advanced (3000-4000 level).

Bachelor of Arts
Major in Computer Science
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 120 hours is required for graduation. Of those hours, 9 hours must be writing intensive and 36 hours must be advanced. Advanced courses are numbered 3000-4000 level.
2. A minimum of 46 hours must be completed in the general education core. Refer to the University College section of this catalog for additional information about general education core curriculum requirements.
3. Computer Science majors must take eight hours (2 courses) from: BIO 1430 & 1431; PHYS 1410 & 1420 [or 1430 & 2425]; CHEM 1141 and 1341, plus 1142 and 1342; or GEOL 1410 & 1420. The eight hours (2 courses) must be from the same science (BIO, CHEM, GEOL, or PHYS) as listed above.
4. MATH 2417 or 2471 may substitute for the MATH 1317, 1319, 1329, or 2321 requirement.
5. Students pursuing the BA degree are required to complete 6 hours of modern language (2310 and 2320) in the same modern language. Most students will have to complete 1410 and 1420 as prerequisites before attempting 2310.
6. Students pursuing the BA degree are required to complete an additional 3 hours of English literature in addition to the core curriculum English literature requirement. Students may select from ENG 2310, 2320, 2340, 2359, 2360, ENG 3303 (Technical Writing), or ENG 3311 (Writing for the Computer Industry) to fulfill this requirement.
7. Computer Science majors must complete a CS project course from: CS 3468, 4326, or 4398.
8. A minor is required, and it is recommended that it be chosen in consultation with the academic advisor.
9. The minimum number of hours required for the degree is 120. The number of free electives a student will complete varies, depending on the number of hours needed to satisfy the 120 and/or the 36 advanced or 9 hours writing intensive requirements. Students should consult with the academic advisor before enrolling in any free elective courses to ensure that electives are needed.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	CS 2308	3	CS 2315	3	CS 3358	3
MATH 1317, 1319, 1329, or 2321 (see gen. req. 4)	3	MATH 2358	3	CS 2318	3	CS 2420	4
US 1100	1	Science (see gen. req. 3)	4	MATH 3398	3	Modern Language 1420	4
ENG 1310	3	ENG 1320	3	Modern Language 1410 (see gen. req. 5)	4	Science (see gen. req. 3)	4
COMM 1310	3	PHIL 1305 or 1320	3	ENG Lit 2310, 2320, 2330, 2340, 2359, 2360	3		
PFW one course	1						
Total	15	Total	16	Total	16	Total	15

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 3398	3	CS Advanced Elective	3	CS 4354	3	CS Advanced Elective	3
Second ENG Lit 2310, 2320, 2330, 2340, 2359, 2360 or 3303 or 3311 (see gen. req. 6)	3	Modern Language 2320	3	CS Project (CS 3468, 4326, or 4398)	3	CS Advanced Elective	3
Modern Language 2310	3	Minor (see gen. req. 8)	3	Minor (see gen. req. 8)	3	Minor (see gen. req. 8)	3
Minor (see gen. req. 8)	3	ART, DAN, MU, or TH 2313	3	Social Science ANTH 1312, ECO 2301, ECO 2314, GEO 1310, SOCI 1310, PSY 1300	3	POSI 2320	3
HIST 1310	3	HIST 1320	3	POSI 2310	3		
		PFW (one course)	1				
Total	15	Total	16	Total	15	Total	12

Bachelor of Arts
Major in Computer Science
(with Teacher Certification)
Minimum required: 129 semester hours

General Requirements:

1. A minimum of 129 hours will be completed for students pursuing teacher certification. Of those hours, 9 hours must be writing intensive, and 36 hours must be advanced. Advanced courses are 3000-4000 level courses.
2. A minimum of 46 hours must be completed in the general education core. Refer to the University College section of this catalog for additional information about general education core curriculum requirements.
3. Computer Science majors must take eight hours (2 courses) from: BIO 1430 &1431; PHYS 1410 & 1420 [or 1430 & 2425]; CHEM 1141 and 1341, plus 1142 and 1342; or GEOL 1410 & 1420. The eight hours (2 courses) must be from the same science (BIO, CHEM, GEOL, or PHYS) as listed above.
4. MATH 2417 or 2471 may substitute for the MATH 1317, 1319, 1329, or 2321 requirement.
5. Students pursuing the BA degree are required to complete 6 hours of language (2310 and 2320) in the same modern language. Most students will have to complete 1410 and 1420 as prerequisites before attempting 2310.
6. Students pursuing the BA degree are required to complete an additional 3 hours of English literature in addition to the core curriculum English requirement. Students may select from ENG 2310, 2320, 2330, 2340, 2359, 2360, ENG 3303 (Technical Writing), or ENG 3311 (Writing for the Computer Industry) to fulfill this requirement.
7. Computer Science majors must complete a CS project course from: CS 3468, 4326, or 4398.
8. A minor is required. Students seeking teacher certification will automatically satisfy a minor in Secondary Education when they successfully complete the 21 hours of Professional Education sequence of courses under the College of Education (CI 3325, 4332, 4370, 4343, RDG 3323. and EDST 4681--Student Teaching).
9. The minimum number of hours required for the degree is 129 so in most cases, a student pursuing teacher certification in CS will not need to complete additional elective courses. Students should consult with the academic advisor before enrolling in any free elective courses.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	CS 2308	3	CS 2315	3	CS 3358	3
MATH 1317, 1319, 1329,		MATH 2358	3	CS 2318	3	CS 2420	4
or 2321 (see gen. req. 4)	3	Science (see gen. req. 3)	4	MATH 3398	3	Modern Language 1420	4
US 1100	1	ENG 1320	3	Modern Language 1410 (see gen. req. 5)	4	Science (see gen. req. 3)	4
ENG 1310	3	PHIL 1305 or 1320	3				
COMM 1310	3				3		
PFW one course	1						
Total	15	Total	16	Total	13	Total	15

Sophomore Year - Summer I		Sophomore Year - Summer II		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ENG Lit 2310, 2320, 2330,		ART, DAN, MU, or TH 2313	3	CS 3398	3	CS Advanced Elective	3
2340, 2359, 2360	3	HIST 1320	3	Second ENG Lit 2310, 2320, 2330,		CS Advanced Elective	3
HIST 1310	3			2340, 2359, 2360	3	CS Project Course CS 3468, 4326, 4398	3-4
				CS 4354	3	Modern Language 2320	3
				Modern Language 2310	3	CI 4332	3
				CI 3325	3		
Total	6	Total	6	Total	15	Total	15

Junior Year - Summer I		Junior Year - Summer II		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
POSI 2310	3	POSI 2320	3	CS Advanced Elective	3	EDST 4681 (Student Teaching)	6
Social Science ANTH 1312, ECO 2301, ECO 2314, GEO		PFW (one course)	1	CI 4370	3		
1310, SOCI 1310, PSY 1300	3			CI 4343	3		
				RDG 3323	3		
Total	6	Total	4	Total	12	Total	6

Bachelor of Science
Major in Computer Science
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 120 hours is required for graduation. Of those, 9 hours must be writing intensive and 36 hours must be advanced. Advanced courses are 3000-4000 level courses.
2. A minimum of 46 hours must be completed in the general education core. Refer to the University College section of this catalog for additional information about general education core curriculum requirements.
3. Computer Science majors must take sixteen hours (4 courses) from: BIO 1430 & 1431; PHYS 1410 & 1420 [or 1430 & 2425]; CHEM 1141 and 1341, plus 1142 and 1342; or GEOL 1410 & 1420. Eight hours (2 courses) must be from the same science (BIO, CHEM, GEOL, or PHYS) as listed above.
4. A minor is required, and it is recommended that it be chosen in consultation with the academic advisor.
5. Students pursuing the BS are required to complete a total of 17 hours in mathematics. Due to the number of Mathematics hours a student completes, a Mathematics minor is recommended because a student only needs to complete additional advanced MATH electives to satisfy the minor in mathematics.
6. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of language taken in high school, then two semesters of the same modern language must be taken at the college level.
7. Students pursuing the BS degree are required to complete an additional 3 hours of English literature in addition to the core curriculum English requirement. Students may select from ENG 2310, 2320, 2330, 2340, 2359, 2360, ENG 3303 (Technical Writing), or ENG 3311 (Writing for the Computer Industry) to fulfill this requirement.
8. Computer Science majors must complete one CS project course from: CS 3468, 4326, or 4398.
9. The minimum number of hours required for the degree is 120, so the number of free electives a student will complete will vary depending on the number of hours a student may need to achieve the 120 and/or the 36 advanced or 9 hours writing intensive requirements. Students need to consult with the academic advisor before enrolling in any free elective courses.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	CS 2308	3	CS 2315	3	CS 3358	3
MATH 2358		MATH 2471	4	CS 2318	3	CS 2420	4
US 1100	3	ENG 1320	3	MATH 3398	3	MATH 2472	4
ENG 1310	1	PHIL 1305 or 1320	3	Science (see gen. req. 3)	4	Science (see gen. req. 5)	4
COMM 1310	3	Social Science ANTH 1312, ECO		ENG Lit 2310, 2320, 2330, 2340, 2359,			
PFW one course	3	2301, ECO 2314, GEO 1310,		2360	3		
	1	SOCI 1310, PSY 1300	3				
Total	15	Total	16	Total	16	Total	15

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 3398	3	CS 3339	3	CS 4354	3	CS Advanced Elective	3
CS Elective	3	CS Advanced Elective	3	CS Project Course CS 3468,		CS Advanced Elective	3
Second ENG Lit 2310, 2320, 2330,		MATH 3305	3	4326, 4398 (see gen. req. 8)	3-4	Minor (see gen. req. 4)	3
2340, 2359, 2360 (see gen. req. 7)	3	Science (see gen. req. 3)	4	POSI 2310	3	POSI 2320	3
Science (see gen. req. 3)	4	HIST 1320	3	ART, DAN, MU, or TH 2313	3	Elective (see gen. req. 9)	0-1
HIST 1310	3	PFW one course	1				12-13
Total	16			Total	12-13	Total	
		Total	17				

Bachelor of Science
Major in Computer Science
(with Concentration in Computer Engineering)
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 121 hours is required for graduation. Of those, 9 hours must be writing intensive and 36 hours must be advanced. Advanced courses are 3000-4000 level courses.
2. A minimum of 46 hours must be completed in the general education core. Refer to the University College section of this catalog for additional information about general education core curriculum requirements.
3. Computer Science majors must take sixteen hours (4 courses) from: BIO 1430 & 1431; PHYS 1410 & 1420 [or 1430 & 2425]; CHEM 1141 and 1341, plus 1142 and 1342; or GEOL 1410 & 1420. Eight hours (2 courses) must be from the same science (BIO, CHEM, GEOL, or PHYS) as listed above.
4. A minor is required, and it is recommended that it be chosen in consultation with the academic advisor.
5. Students pursuing the BS are required to complete a total of 17 hours in mathematics. Due to the number of mathematics hours a student completes, a mathematics minor is recommended because a student only needs to complete additional advanced MATH electives to satisfy the minor in mathematics.
6. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of language taken in high school, then two semesters of the same modern language must be taken at the college level.
7. Students pursuing the BS degree are required to complete an additional 3 hours of English literature in addition to the core curriculum English requirement. Students may select from ENG 2310, 2320, 2330, 2340, 2359, 2360, ENG 3303 (Technical Writing), or ENG 3311 (Writing for the Computer Industry) to fulfill this requirement.
8. Computer Science majors must complete one CS project course from: 4326 or 4398.
9. The concentration in computer engineering consists of EE 2400, CS 3468, and two courses chosen from CS 4310, CS 4318, CS 4328, or CS 4388.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	CS 2308	3	CS 2315	3	CS 3358	3
MATH 2358		MATH 2471	4	CS 2318	3	CS 2420	4
US 1100	3	ENG 1320	3	MATH 3398	3	MATH 2472	4
ENG 1310	1	PHIL 1305 or 1320	3	Science (see gen. req. 3)	4	Science (see gen. req. 5)	4
COMM 1310	3	Social Science ANTH 1312, ECO		ENG Lit 2310, 2320, 2330, 2340, 2359,			
PFW one course	3	2301, ECO 2314, GEO 1310,		2360	3		
	1	SOCI 1310, PSY 1300	3				
Total	15	Total	16	Total	16	Total	15

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 3398	3	CS 3339	3	CS 4354	3	Two of CS 4310, 4318, 4328,	
EE 2400	4	CS 3468	4	CS Project Course CS 4326 or		or 4388	6
Second ENG Lit 2310, 2320, 2330,		MATH 3305	3	4398 (see gen. req. 8)	3	Minor (see gen. req. 4)	3
2340, 2359, 2360 (see gen. req. 7)	3	Science (see gen. req. 3)	4	HIST 1320	3	POSI 2320	3
Science (see gen. req. 3)	4	HIST 1310	3	ART, DAN, MU, or TH 2313	3		
POSI 2310	3	PFW one course	1				
Total	17	Total	18	Total	12	Total	12

Bachelor of Science
Major in Computer Science
(with Teacher Certification)
Minimum required: 129 semester hours

General Requirements:

1. A minimum of 129 hours is required for graduation. Of those hours, 9 hours must be writing intensive hours, and 36 must be advanced. Advanced courses are 3000-4000 level courses.
2. A minimum of 46 hours must be completed in the general education core. Refer to the University College section of this catalog for general education core curriculum requirements.
3. Computer Science majors must take sixteen hours (4 courses) from: BIO 1430 & 1431; PHYS 1410 & 1420 [or 1430 & 2425]; CHEM 1141 and 1341, plus 1142 and 1342; or GEOL 1410 & 1420. Eight hours (2 courses) must be from the same science (BIO, CHEM, GEOL, or PHYS) as listed above.
4. A minor is required. Students seeking teacher certification automatically satisfy a minor in Secondary Education when they successfully complete the 21 hours of Professional Education sequence of courses under the College of Education (CI 3325, CI 4332, CI 4343, RDG 3323, and EDST 4681—Student Teaching).
5. Students pursuing the BS are required to complete a total of 17 hours in mathematics.
6. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of language taken in high school, then two semesters of the same modern language (1410 and 1420) must be taken at the college level.
7. Students pursuing the BS degree are required to complete an additional 3 hours of English literature in addition to the core curriculum English requirement. Students may select from ENG 2310, 2320, 2330, 2340, 2359, 2360, ENG 3303 (Technical Writing), or ENG 3311 (Writing for the Computer Industry) to fulfill this requirement.
8. Computer Science majors must complete one CS project course from: CS 3468, 4326, or 4398.
9. The minimum number of hours required for the degree is 129 so in most cases, a student pursuing teacher certification will not need to complete additional elective courses. Students should consult with the academic advisor before enrolling in any free elective courses.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	CS 2308	3	CS 2315	3	CS 3358	3
MATH 2358	3	MATH 2471	4	CS 2318	3	CS 2420	4
US 1100	1	ENG 1320	3	MATH 3398	3	MATH 2472	4
ENG 1310	3	PHIL 1305 or 1320	3	Science (see gen. req. 3)	4	Science (see gen. req. 3)	4
COMM 1310	3	Social Science ANTH 1312, ECO 2301, ECO 2314,		ENG Lit ENG 2310, 2320, 2330, 2340,			
PFW one course	1	GEO 1310, SOCI 1310, PSY 1300	3	2359, 2360	3		
Total	15	Total	16	Total	16	Total	15

Sophomore Year - Summer I		Sophomore Year - Summer II		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
HIST 1310	3	HIST 1320	3	CS 3398	3	CS 3339	3
POSI 2310	3	POSI 2320	3	CS 4354	3	CS Advanced Elective	3
				CI 4332	3	CS Project Course (see gen. req. 5)	3
				Second ENG Lit (see gen. req. 7) or 3303 or 3313	3	CI 3325	3
				Science (see gen. req. 3)	3	Science (see gen. req. 4)	4
Total	6	Total	6		4		
				Total		Total	16
					16		

Junior Year - Summer I		Junior Year - Summer II		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS Advaned Elective	3	ART, DAN, MU, or TH 2313	3	CI 4370	3	EDST 4681 (Student Teaching)	6
CS Advanced Elective	3	PFW one course	1	CI 4343	3		
				RDG 3323	3		
				MATH 3305	3		
Total	6	Total	4	Total	12	Total	6

Minor in Computer Science

A minor in Computer Science consists of CS 1428, 2308, 2318, 2420, 3358, at least six advanced CS hours, plus MATH 2358 and 3398.

Courses in Computer Science (CS)

1308 (COSC 1300) Computer Literacy and the Internet. (2-2) A study of the uses of computers and their effects on society. Text processing, spreadsheets, databases, and Web programming. Does not count for computer science credit towards a minor, a BS, or a BA in computer science.

1319 Fundamentals of Computer Science. (3-0) Provides fundamental knowledge of the six layers of computer science as per the ACM CS0 curriculum. The information, hardware, programming, operating system, applications, and communications layers are presented plus appropriate open computer laboratory exercises. Does not count for computer science credit towards a minor, BS, or BA in computer science.

1428 (COSC 1415) Foundations of Computer Science I. (3-2) Introductory course for computer science majors, minors and others desiring technical introduction to computer science. Contains overview of history and structure of the digital computer, including binary data representation. Problem solving, algorithm development, structured programming, good coding style, and control structures of C++ are emphasized. Prerequisite or co-requisite: MATH 1315.

2308 (COSC 2320) Foundations of Computer Science II. (3-0) Fundamentals of object-oriented programming. Introduction to abstract data types (ADTs) including lists, stacks, and queues. Searching and sorting. Pointers and dynamic memory allocation. A continuation of CS 1428. Prerequisite: C or higher in CS 1428.

2315 Computer Ethics. (3-0) Primarily for computer science majors, focusing on the ethical codes of the professional societies, the philosophical bases of ethical decision-making, and the examination of several contemporary case studies. Prerequisites: CS 1428, ENG 1310, COMM 1310, and PHIL 1305 with grades of C or higher. (WI)

2318 (COSC 2325) Assembly Language. (3-0) A course covering the organization of digital computers; assembly language programming including addressing, looping, logic, shifting and masking operations, macros, subroutines, co-routines, arithmetic algorithms, and recursion. Prerequisite: MATH 2358 with a grade of C or higher. Prerequisite or Co-requisite: CS 2308 with a grade of C or higher.

2358 (COSC 2315) Introduction to Data Structures. (3-0) A course covering classic data structures and an introduction to object-oriented development. Prerequisite: CS 2308 with a grade of C or higher. Co-requisite: MATH 3398.

2378 Topics in Computer Science. (3-0) Selected topics in computer science. May be repeated with different emphasis for additional credit. Prerequisite: Consent of instructor.

2388 Internet Programming on the World Wide Web. (3-0) An introductory course covering Web page construction using HTML and Java Script. Does not count for computer science credit towards a minor, BS, or BA in computer science.

2420 Digital Logic. (3-2) An introduction to fundamental computer technologies, including Boolean logic design, logic circuits and devices, and basic computer hardware. A laboratory providing hands-on experience with electricity, combinational and sequential digital circuits, and computer hardware. Prerequisite: C or higher in CS 1428.

2428 Applications Programming in Visual Basic. (3-2) A self-contained programming course using Visual Basic. Does not count for computer science credit towards a BS in computer science.

3320 Internet Software Development. (3-0) A course providing foundations for the construction and design of static and dynamic Web pages with database applications. This will include server-side and client-side software development. Prerequisite: C or higher in CS 2308 or consent of instructor.

3339 Computer Architecture. (3-0) Use of fundamental hardware components. Topics include ALU's, single and multiple cycle datapath and control, RISC vs. CISC, pipelining, caches, I/O, virtual memory and related performance issues. Prerequisites: (CS 2420 or EE 2420), (CS 2315 or EE 2400), and (CS 2318 or EE 3420) with grades of C or higher.

3358 Data Structures. (3-0) A course covering classic data structures and an introduction to object-oriented development. Prerequisite: CS 2308 with a grade of C or higher. Prerequisite or Co-requisite: MATH 3398 with a grade of C or higher.

3378 Theory of Automata. (3-0) An introduction to automata theory, computability, and formal languages. Prerequisite: CS 3358 with a grade of C or higher.

3398 Software Engineering. (3-0) The study of software design, implementation, and validation techniques through team projects. Structured analysis, programming style, and project documentation are emphasized in large software projects. Prerequisites: (CS 2315 or EE 2400) and CS 3358 with grades of C or higher. (WI)

3468 Embedded Computer Systems. (3-2) Studies the architecture of embedded systems, micro-controllers, their peripherals, languages, and operating systems and the special techniques required to use them. Prerequisites: C or higher in CS 2318 and CS 2420.

4100 Computer Science Internship. (0-20) Provides on-the-job training supervised by computer scientists in industry internship programs approved by the department. Prerequisite: CS majors and minors only.

4298 Undergraduate Research I. (1-2) Supervised individual research project in a mentor-student relationship with a computer science faculty member. Cannot be given degree credit until the satisfactory completion of CS 4299. Prerequisites: Junior standing; major GPA of 3.00; departmental approval.

4299 Undergraduate Research II. (1-2) Supervised individual research projects in a mentor-student relationship with a computer science faculty member. Prerequisites: CS 4298 and departmental approval.

4310 Computer Networks. (3-0) A survey of network architectures and their components. Emphasis will be on media access, network and transport layer protocols. Prerequisite: CS 3358 with a grade of C or higher.

4318 Program Translators. (3-0) A study of computer languages, data structures, algorithms, and theory used in constructing compilers and other program translators. Prerequisite: CS 3358 with a grade of C or higher.

4326 Human Factors of Computer Systems. (3-0) Principles and methods in human factors and ergonomics applied to the design and use of computer systems. Prerequisite: CS 3358 with a grade of C or higher. (WI)

4328 Operating Systems. (3-0) Principles of operating systems. Algorithms for CPU scheduling, memory management, cooperating sequential processes and device management. Prerequisites: (CS 2318 or EE 3420) and CS 3358 with a grade of C or higher.

4332 Introduction to Database Systems. (3-0) Introduction to database concepts, data models, file structures, query languages, database management systems. Prerequisite: CS 3358 with a grade of C or higher.

4335 Digital Signal Processing. (3-0) The course will introduce the techniques of discrete-time systems, Z transform analysis, and filter design techniques, including lab programming with National Instruments LabVIEW and TI signal processors. Prerequisites: MATH 2472 and CS 3358 with grades of C or higher.

4346 Introduction to Artificial Intelligence. (3-0) An introduction to the basic concepts of artificial intelligence; search techniques, knowledge representation, problem solving. Prerequisite: CS 3358 with a grade of C or higher.

4350 Unix Systems Programming. (3-0) Fundamentals of Unix operating systems, Unix file system and environment, C memory allocation, development tools, processes and signals, threads, device drivers, and programming for security. Prerequisite: CS 3358 with a grade of C or higher.

4354 Object-Oriented Design and Implementation. (3-0) An in-depth study of object-oriented design and implementation issues with emphasis on understanding the life cycle of object-oriented software, Unified Modeling Language, inheritance and polymorphism, designing remote and persistent objects, and exception handling. In-depth study of Java object-oriented language. Java will be used for implementing the exercises. Prerequisite: CS 3398.

4368 Survey of Computer Languages. (3-0) A survey of computer languages. Criteria for choosing languages to be covered include history, important development paradigms and environments, and language implementations. Prerequisite: CS 3358 with a grade of C or higher.

4371 Computer System Security. (3-0) Course covers practical aspects of computer system security including managing and producing code for secure systems. Theory, such as cryptography, is introduced as needed. Prerequisite: CS 3358 with a grade of C or higher.

4378 Special Topics in Computer Science. (3-0) Selected topics in computer science. May be repeated with different emphasis for additional credit. Prerequisite: Consent of instructor.

4378P Introduction to Digital Multimedia. (3-0) Concepts, problems and techniques in digital multimedia. Topics include digital representation of video and data compression. Applications, primarily in education and business presentations, and new and potential capabilities, such as video on demand and virtual reality. Prerequisite: Grade of C or higher in CS 3358.

4378T Parallel Programming. (3-0) This course teaches practical aspects of parallel programming. The covered topics include multi-core processors and shared-memory programming, hardware accelerator programming, and distributed-memory machines and message-passing programming. The students will gain the knowledge and skills needed for developing parallel software by writing programs for a variety of parallel computers. Prerequisite: a grade of C or higher in CS 3339 or instructor consent.

4378U Data Mining. (3-0) An introduction to data mining techniques including classification and predication as well as cluster analysis. Students will be familiarized with fields which data mining draws from like database technology, artificial intelligence, machine learning, and neural networks. Prerequisite: CS 3358.

4378V Introduction to Machine Learning. (3-0) Provides systematic introduction to machine learning, covering basic theoretical as well as practical aspects of the use of machine learning methods. Topics include learning theory, learning methods, recent learning models, etc. Application examples include multimedia information retrieval, text recognition, computer vision, etc. Prerequisite: CS 3358 grade of C or higher.

4378W Introduction to Human Computer Interaction (HCI). (3-0) Introduces HCI topics specifically highlighted by new input modalities such as eye-tracking. Considers new input modalities as new channels for data gathering including multimedia compression, interface design, usability evaluation, biometrics. Application of HCI as interdisciplinary research tool also will be discussed. Prerequisite: CS 3358 with grade of C or higher.

4378Y Forensic Systems. (3-0) This course is a survey of computing systems as tools and as targets in investigations, including technical and legal issues and investigative procedures in both civil and criminal domains, ethical issues, software tools for evidence discovery and gathering, and case studies. Prerequisite: CS 4350 or consent of instructor.

4378Z Practical Game Development. (3-0) Course teaches practical aspects of computer game design and implementation. Topics include graphics game engines, game physics, AI methods applied to games, and software architectures for computer games. Students will gain knowledge and skills needed for game development via team projects. Prerequisite: CS 3398 with grade of C or higher.

4388 Computer Graphics. (3-0) A study of the hardware and software used in graphic representation and interpretation of data. Prerequisites: CS 3358 with a grade of C or higher and familiarity with trigonometric functions.

4395 Independent Study in Computer Science. (3-0) Open to undergraduate students on an independent basis by arrangement with the faculty member concerned. Requires department chair approval. Repeatable for credit with different emphasis.

4398 Software Engineering Project. (3-0) Students undertake a software development project. They work in teams, developing requirements and designs which they will implement and test. Prerequisite: CS 3398 with a grade of C or higher.

Ingram School of Engineering

Roy F. Mitte Building, Room 5202
T: 512.245.1826 F: 512.245.7771
www.engineering.txstate.edu

Degree Programs Offered

BS, major in Electrical Engineering
BS, major in Electrical Engineering
(with Computer Engineering Specialization)
BS, major in Industrial Engineering
BS, major in Manufacturing Engineering

The BS with a major in Electrical Engineering provides students the background that is essential for the conception, design, development, and manufacture of electrical, electronic and information technology products and systems. Students may specialize in the areas of networks and communication systems, micro and nano devices and systems, or computer engineering. Proficiency in mathematics is especially important in Electrical Engineering. In order to be admitted to the EE program, a student needs to be qualified to take MATH 2417 or higher.

The BS with a major in Industrial Engineering provides students the background that is essential for improving the productivity, quality, safety, and cost effectiveness of all types of systems and processes. Industrial engineers are typically engaged in the areas of quality assurance, ergonomics, production and operations management, facilities design, work design, system optimization, information technology, and industrial safety.

The BS with a major in Manufacturing Engineering is designed to provide students with the mathematics, science, management, engineering, and applications skills needed to become manufacturing engineers. These engineers are typically responsible for promoting manufacturability, process planning, tool design, cost estimation, factory layout, work methods, quality assurance, automation, and systems integration. The degree has a concentration in general manufacturing or semiconductor/high technology manufacturing.

For information on engineering technology, industrial technology, or the 3/2 pre-engineering option in physics, please see the Departments of Engineering Technology and Physics sections of this catalog.

Mission Statement

The mission of the Ingram School of Engineering is:

1. To provide students with an exceptional education in various disciplines of engineering,
2. To establish, through dedicated faculty, a nationally recognized research program, preparing interested students to achieve excellence in graduate studies and research, and
3. To serve the State of Texas and the nation by creating highly skilled, diverse, and motivated professionals capable of technological innovation and dedicated to the improvement of society.

Vision Statement

The Ingram School of Engineering will be a nationally recognized institution of higher education, serving students and employers with a complete set of accredited engineering programs supported by a faculty which maintains high standards of teaching, research, and service. To accomplish this vision, we will:

1. Engage undergraduate and graduate students with innovative, multidisciplinary, and nationally recognized funded research programs,
2. Emphasize quality undergraduate and graduate education using a practical, interactive, and contemporary learning environment,
3. Produce first-generation professional college graduates as part of an HSI-designated university; be recognized for exceptional community service; and create tight bonds with alumni who will serve as professional mentors, sponsors, and advisors.
4. Promote a student-centered culture based on collegiality, scholarship, enthusiasm, integrity, and mutual respect among diverse faculty, staff, and students.

Bachelor of Science
Major in Electrical Engineering
(with Micro and Nano Devices and Systems Specialization)
Minimum required: 137 semester hours

General Requirements:

1. In order to declare Electrical Engineering as a major, students must meet one of the following prerequisites: ACT Math score of 24 or higher, SAT Math score of 520 (re-centered) or higher, or credit for one of the following math courses with a grade of "C" or higher: MATH 1315, 1317, 1319, or 1329. Students who do not meet the above prerequisites may choose Pre- Electrical Engineering as their major. Pre- Electrical Engineering students who complete one of the following math courses with a grade of "C" or higher may declare Electrical Engineering as their major: MATH 1315, 1317, 1319, or 1329.
2. All Electrical Engineering majors must complete Electrical Engineering (EE) course prerequisites with a grade of "C" or higher.
3. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
4. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
5. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Freshman Year - Summer I		Freshman Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1341, 1141	4	PHYS 1430	4	HIST 1320	3	PHIL 1305 or 1320	3
HIST 1310	3	ENGR 2300	3	PFW one course	1	ENG Literature (see gen. req. 2)	
MATH 2471	4	MATH 2472	4				3
US 1100	1	ENG 1320	3				
ENG 1310	3						
Total	15	Total	14	Total	4	Total	6

Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester		Sophomore Year - Summer Session		Junior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
EE 2400	4	EE 2420	4	COMM 1310	3	EE 3400	4
MATH 3323	3	MATH 3375	3	POSI 2310	3	EE 3340	3
MATH 3373	3	MATH 3377	3	PFW one course	1	ENGR 3315	3
PHYS 2425	4	PHYS 2435	4			IE 3320	3
ECO 2301	3	CS 1428	4	Total	7	POSI 2320	3
Total	17	Total	18			Total	16

Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr
EE 3420	4	EE 4350	3	EE 4355 or TECH 4394	3
EE 3350	3	EE 4352	3	EE 4358	3
EE 3355	3	EE 4390	3	EE 4391	3
EE 3370	3	TECH 4392	3	MFGE 4376	3
ART, DAN, MU, or TH 2313	3				
Total	16	Total	12	Total	12

Bachelor of Science
Major in Electrical Engineering
(with Networks and Communication Systems Specialization)
Minimum required: 137 semester hours

General Requirements:

1. In order to declare Electrical Engineering as a major, students must meet one of the following prerequisites: ACT Math score of 24 or higher, SAT Math score of 520 (re-centered) or higher, or credit for one of the following math courses with a grade of "C" or higher: MATH 1315, 1317, 1319, or 1329. Students who do not meet the above prerequisites may choose Pre- Electrical Engineering as their major. Pre- Electrical Engineering students who complete one of the following math courses with a grade of "C" or higher may declare Electrical Engineering as their major: MATH 1315, 1317, 1319, or 1329.
2. All Electrical Engineering majors must complete Electrical Engineering (EE) course prerequisites with a grade of "C" or higher.
3. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
4. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
5. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Freshman Year - Summer I		Freshman Year - Summer II	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1341, 1141	4	PHYS 1430	4	HIST 1320	3	PHIL 1305 or 1320	3
MATH 2471	4	ENGR 2300	3	PFW one course	1	ENG Literature (see gen. req. 2)	
US 1100	1	MATH 2472	4				3
ENG 1310	3	ENG 1320	3				
HIST 1310	3						
Total	15	Total	14	Total	4	Total	6

Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester		Sophomore Year - Summer Session		Junior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
EE 2400	4	EE 2420	4	COMM 1310	3	EE 3400	4
MATH 3323	3	MATH 3375	3	POSI 2310	3	EE 3340	3
MATH 3373	3	MATH 3377	3	PFW one course	1	ENGR 3315	3
PHYS 2425	4	PHYS 2435	4			IE 3320	3
ECO 2301	3	CS 1428	4	Total	7	POSI 2320	3
Total	17	Total	18			Total	16

Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr
EE 3420	4	EE 4350	3	EE 4372	3
EE 3350	3	EE 4370	3	EE 4374, 4376, 4378 (choose two)	6
EE 3355	3	EE 4377	3	EE 4391	3
EE 3370	3	EE 4390	3		
ART, DAN, MU, or TH 2313	3				
Total	16	Total	12	Total	12

Bachelor of Science
Major in Electrical Engineering
(with Computer Engineering Specialization)
Minimum required: 137 semester hours

General Requirements:

1. In order to declare Electrical Engineering as a major, students must meet one of the following prerequisites: ACT Math score of 24 or higher, SAT Math score of 520 (re-centered) or higher, or credit for one of the following math courses with a grade of "C" or higher: MATH 1315, 1317, 1319, or 1329. Students who do not meet the above prerequisites may choose Pre- Electrical Engineering as their major. Pre- Electrical Engineering students who complete one of the following math courses with a grade of "C" or higher may declare Electrical Engineering as their major: MATH 1315, 1317, 1319, or 1329.
2. All Electrical Engineering majors must complete Electrical Engineering (EE) course prerequisites with a grade of "C" or higher.
3. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
4. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
5. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1341, 1141	4	PHYS 1430	4	ENG Literature (see gen. req. 4)	3	EE 3420	4
CS 1428	4	CS 2308	3	MATH 2358	3	MATH 3398	3
MATH 2471	4	MATH 2472	4	EE 2400	4	MATH 3373	3
US 1100	1	ENG 1320	3	PHYS 2425	4	EE 3400	4
ENG 1310	3	EE 2420 or CS 2420	4	MATH 3323	3	CS 3358	4
PFW one course	1						
Total	17	Total	18	Total	17	Total	18

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
HIST 1310	3	HIST 1320	3	PHIL 1305	3	ART, DAN, MU, or TH 2313	3
ECO 2301	3	POSI 2310	3	POSI 2320	3	COMM 1310	3
PFW	1	CS 3339	3	CS 3398	3	EE 4391	3
CS 4328	3	EE 3370	3	EE 4372 or CS 4310	3	EE 4321, 4323, 4399C, 4399E, CS 4332,	
EE 3350	3	EE 4352	3	EE 4377	3	4388 (choose 6 hours)	6
MATH 3377	3	IE 3320	3	EE 4390	3		
Total	16	Total	18	Total	18	Total	15

Bachelor of Science
Major in Industrial Engineering
Minimum required: 135 semester hours

Industrial Engineering Mission Statement

Our mission is:

To provide an excellent and innovative educational setting to our students so they can learn and discover how complex systems work better. The IE program strives to maintain a comprehensive curriculum that enables students to become leading engineers and/or creative researchers in the global marketplace and/or in graduate studies. The program seeks to collaborate with private and public sectors in the search of methodologies and creative solutions to problems that contribute to the advancement of education, technology, and professional development. Through plans and activities that search to embrace a student population of strong diversity, the program attempts to be a significant provider of global workforce.

Industrial Engineering Educational Objectives

1. Graduates who perform as industry leaders in the global marketplace, capable of successfully planning, controlling, and implementing large-scale projects.
2. Graduates who understand and apply the principles of science, technology, engineering, and math involving industry-relevant problems.
3. Graduates who contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches, and systems thinking methodologies.
4. Graduates who maintain high standards of professional and ethical responsibility.
5. Graduates who flourish and work effectively in diverse, multicultural environments emphasizing the application of teamwork and communication skills.
6. Graduates who practice life-long learning to sustain technical currency and excellence throughout one's career, and who promote the profession and its benefits to society.

General Requirements:

1. In order to declare Industrial Engineering as a major, students must meet one of the following prerequisites: ACT Math score of 24 or higher, SAT Math score of 520 (re-centered) or higher, or credit for one of the following math courses with a grade of "C" or higher: MATH 1315, 1317, 1319, or 1329. Students who do not meet the above prerequisites may choose Pre-Industrial Engineering as their major. Pre-Industrial Engineering students who complete one of the following math courses with a grade of "C" or higher may declare Industrial Engineering as their major: MATH 1315, 1317, 1319, or 1329.
2. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
3. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
4. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
5. Six hours of IE electives to be chosen from: IE 4330 (fall), IE 4340 (fall); MFGE 4367 (spring), MFGE 4392 (spring), MFGE 4395 (fall); IE 4399A, IE 4399B, IE 4399C, IE 4399D.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1341, 1141	4	PHYS 1430	4	PHYS 2425	4	CS 1428	4
ENG 1310	3	ENG 1320	3	COMM 1310	3	MATH 3323	3
ENGR 1313	3	ENGR 2300	3	MATH 3377	3	MATH 3375	3
MATH 2471	4	HIST 1310	3	POSI 2310	3	ART, DAN, MU, or TH 2313	3
US 1100	1	MATH 2472	4	MFGE 2332	3	ECO 2301	3
				HIST 1320	3	POSI 2320	3
Total	15	Total	17	Total	19	Total	19

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ENGR 3311	3	IE 3310	3	IE 4310	3	IE 4320	3
ENGR 3315	3	IE 3330	3	IE 3360	3	IE 4350	3
ENGR 3373	3	IE 3340	3	IE 4380	3	IE 4360	3
IE 3320	3	IE 4355	3	IE Elective (see gen. req. 5)	3	IE Elective (see gen. req. 5)	3
PHIL 1305 or 1320	3	ENG Literature (see gen. req. 3)	3	MFGE 4396	3	IE 4390	3
PFW one course	1	PFW one course	1	IE 4370	3		
Total	16	Total	16	Total	18	Total	15

Bachelor of Science
Major in Manufacturing Engineering
(with General Manufacturing Concentration)
Minimum required: 132 semester hours

Manufacturing Engineering Mission Statement
Our mission is

1. To sustain a quality, student-centered, industry-oriented engineering curriculum,
2. To attract students and prepare them with the knowledge, practical skills, and abilities to perform as highly competent engineers in the global marketplace and/or in graduate studies, and
3. To produce graduates skilled in materials and manufacturing processes; process, assembly and product engineering; manufacturing competitiveness and systems design.

Manufacturing Engineering Educational Objectives

1. Graduates who perform as engineering leaders in the global marketplace.
2. Graduates who understand and apply the principles of math, science, and engineering in design and manufacturing related activities.
3. Graduates who contribute to the profitable growth of businesses.
4. Graduates who maintain high standards of professional and ethical responsibility.
5. Graduates who practice lifelong learning.

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Six hours of Manufacturing Processes elective to be chosen from:, TECH 4330 (fall), MFGE 4367 (spring), or MFGE 4392 (spring).
5. Three to four hours of Math/ Science elective to be chosen from: MATH 3373, MATH 3330, PHYS 2435, PHYS 3315, or CHEM 1342 and 1142.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1341, 1141	4	PHYS 1430	4	IE 3320	3	CS 1428	4
ENGR 1313	3	ENGR 2300	3	MATH 3323	3	MATH 3375	3
MATH 2471	4	ENG 1320	3	MFGE 2332	3	MFGE 3316	3
US 1100	1	MATH 2472	4	PHYS 2425	4	ECO 2301	3
ENG 1310	3	COMM 1310	3	HIST 1310	3	HIST 1320	3
PFW one course	1			PFW one course	1		
Total	16	Total	17	Total	17	Total	16

Sophomore Year - Summer		Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
MGT 3303	3	ENGR 3311	3	ENGR 3315	3	IE 3360	3
MATH 3377	3	ENGR 3373	3	IE 3330	3	MFGE 4363	3
		MFGE 4396	3	MFGE 4365	3	MFGE 4395	3
		Math/Science Elective (see gen. req. 5)	3-4	MFGE 4376	3	Manufacturing Processes (see gen. req. 4)	3
		PHIL 1305 or 1320	3	POSI 2310	3	POSI 2320	3
Total	6	Total	15-16	Total	15	Total	15

Senior Year - 2nd Semester	
Course	Hr
IE 4355	3
MGT 4330	3
Manufacturing Processes (see gen. req. 4)	3
ART, DAN, MU, or TH 2313	3
ENG Literature (see gen. req. 2)	3
Total	15

Bachelor of Science
Major in Manufacturing Engineering
(with Semiconductor Manufacturing Concentration)
Minimum required: 139 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471; natural science- CHEM 1341/1141 and PHYS 1430; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Three semester hours of Semiconductor Manufacturing elective to be chosen from: PHYS 4320 (see dept.), PHYS 4340 (see dept.), or MFGE 4394 (see dept.).
5. Three to four hours of Math/Science elective chosen from: MATH 3330, MATH 3373, PHYS 2435, PHYS 3315, or CHEM 1342 & 1142.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Freshman Year - Summer I & Summer II		Sophomore Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	ENGR 2300	3	EE 2400	4	IE 3320	3
ENGR 1313	3	MATH 2472	4	COMM 1310	3	MATH 3323	3
MATH 2471	4	PHYS 1430	4			MFGE 2332	3
US 1100	1	COMM 1310	3			PHYS 2425	4
ENG 1310	3	ENG 1320	3			HIST 1310	3
PFW one course	1					PFW one course	1
Total	16	Total	17	Total	7	Total	17

Sophomore Year - 2nd Semester		Sophomore Year - Summer		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	MGT 3303	3	ENGR 3311	3	MFGE 4392	3
MATH 3375	3	MATH 3377	3	ENGR 3373	3	MFGE 4365	3
MFGE 3316	3	EE 2400	4	MFGE 4396	3	MFGE 4376	3
ECO 2301	3	PHIL 1305 or 1320	3	TECH 4374 or EE 2420	3-4	IE 3330	3
HIST 1320	3			Math/Science Elective (see gen. req. 5)	3-4	POSI 2310	3
Total	16	Total	13	Total	15-17	Total	15

Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr
IE 3360	3	Semiconductor Manufacturing Elective (see gen. req. 4)	3
MFGE 4363	3	IE 4355	3
MFGE 4395	3	ART, DAN, MU, or TH 2313	3
ENGR 3315	3	MGT 4330	3
POSI 2320	3	ENG Literature (see gen. req. 2)	3
Total	15	Total	15

Courses in Electrical Engineering (EE)

2400 Introduction to Electrical Engineering. (3-2) This course provides an introduction to the profession of Electrical Engineering and its specialties. Fundamental dc circuit analysis and properties of electrical components are also studied, and laboratory skills are developed. Prerequisites: MATH 2471.

2420 Digital Logic. (3-2) An introduction to fundamental computer technologies, including Boolean logic design, logic circuits and devices, and basic computer hardware are studied. Laboratories provide hands-on experience with electricity, combinational and sequential digital circuits, and computer hardware. Prerequisite: C or higher in CS1428.

3340 Fields and Waves. (3-0) Wave propagation, Maxwell's equations, transmission lines, wave guides, and antennas. Prerequisites: MATH 3373 and PHYS 2435. Corequisite: EE 3300.

3350 Electronics I. (3-3) Analysis and design of active device equivalent circuits with emphasis on transistors, switching circuits, and operational amplifiers. Prerequisites: EE 3300.

3355 Solid State Devices. (3-0) Semiconductor materials, principles of carrier motion, operating principles and circuit models for diodes, bipolar transistors and field-effect transistors. Introduction to integrated circuits. Prerequisites: EE 3300.

3370 Signals and Systems. (3-0) Frequency domain representation of signals and systems and frequency domain concepts for circuit analysis and design. Transfer function and frequency response, Laplace and z-transforms, Fourier series, Fourier transform, and sampling. Prerequisites: EE 3300.

3400 Circuit Analysis. (3-2) Analysis and design of electrical circuits, transient and steady state response, and loop and nodal analysis are covered in the course. Prerequisites: EE 2400. Corequisites: MATH 3323, and PHYS 2425.

3420 Microprocessors. (3-3) Introduction to microprocessors, principles of operation, assembly language programming, timing analysis, and I/O interfacing. Prerequisites: EE 2420.

4350 Electronics II. (3-3) Analysis and design of integrated circuits, feedback, and frequency response. Prerequisites: EE 3350.

4352 Introduction to VLSI Design. (3-1) Analysis of design of CMOS integrated circuits. Introduction to CAD tools for VLSI design. Prerequisites: EE3350. Co requisite: None.

4355 Analog and Mixed Signal Design. (3-2) Operational amplifier design applications, feedback, offset, stability, and compensation. Introduction to random signals and noise, discrete time circuitry analog-to-digital converters, and digital-to-analog converters. Prerequisites: EE 3370 and 4350.

4358 Introduction to Microelectromechanical Systems. (3-1) Fabrication techniques for microelectromechanical devices and systems. Introduction to the design of micromechanical transducers. Corequisite: TECH 4392.

4370 Communication Systems. (3-3) Transmission of signals through linear systems, analog and digital modulation, filtering, and noise. Prerequisites: EE 3300, 3370, and IE 3320.

4372 Communication Networks. (3-1) Data communication concepts, protocols, algorithms, 7-layer OSI model, physical media, LAN architecture and components, Ethernet, FDDI, TCP/IP, and related standards. Prerequisite: EE 2400 and EE 3420. Corequisite: None.

4374 Introduction to Wireless Communication. (3-1) Principles, practice, and system overview of mobile systems. Modulation, demodulation, coding, encoding, and multiple access techniques. Prerequisites: EE 4370.

4376 Introduction to Telecommunications. (3-1) Fundamentals of telecommunications, telephone networks, switching and transmission systems, circuit and packet switching, cell processing, and queuing theory and applications. Prerequisite: None, Co-requisite: EE 4370.

4377 Introduction to Digital Signal Processing. (3-1) Discrete systems, convolution, spectral analysis, and FIR and IIR filter design. Prerequisites: EE 3370.

4378 Data Compression and Error Control Coding. (3-2) Introduction to information theory, information content of messages, entropy and source coding, data compression, channel capacity data translation codes, and fundamentals of error correcting codes. Prerequisite: None, Corequisite: EE 4370.

4390 Electrical Engineering Design I. (1-3) Team-based design of a system or component, which will include oral presentations and written reports. Co-requisite: EE 4350 or EE 4352 or EE 4370. (WI)

4391 Electrical Engineering Design II. (1-3) Advanced team-based design of a system or component, which will include oral presentations and written reports. Prerequisites: EE 4390. (WI)

4399 Special Topics in Electrical Engineering. (3-0) This course will cover advanced topics that cannot be fitted into a regular course in the curriculum. Prerequisite: Faculty advisor approval.

4399A Dynamic Data Acquisition and Analysis. (3-0)

4399B Overview of Information Theory and Coding. (3-0)

4399C Digital Systems Design Using VHDL. (3-0) Design of digital systems using VHDL including implementation of custom microprocessor and peripheral architectures. Prerequisites: EE 3420, CS 2308.

4399E Digital Image Processing. (3-0) This course provides the necessary fundamental techniques to analyze and process digital images. It covers principles, concepts, and techniques of digital image processing and computer vision. Prerequisites: EE 3420, CS 2308.

4399F Fundamentals of Electroceramics. (3-3) Introduction to binary and ternary phase diagrams, non-centro-symmetric crystal structures and symmetry groups, nonlinear dielectrics (including ferroelectricity, piezoelectricity, pyroelectricity), nonlinear magnetics, oxide wideband gap semiconductors, detectors and sensors, brief introduction to MEMS, radhard electronics, and spintronics technology. Research oriented labs related to materials processing, characterization, fabrication, and testing. Prerequisite: ENGR 2300 or equivalent; Co-requisite: EE 3355; GPA of 2.25 or higher.

4399G Fundamentals of Advanced CMOS Technology. (3-0) Key concepts of advanced semiconductor technology including Moore's law, transition from NMOS to CMOS, CMOS scaling, high-K gate dielectrics, metal electrodes, source/drain scaling technology, new channel materials replacing silicon, and three dimensional device structures. Prerequisite: ENGR 3355.

Courses in Engineering (ENGR)

1313 Engineering Design Graphics. (2-2) An introductory communications course in the tools and techniques utilized to produce various types of working drawings. Principles of multiview projections, geometric relationships, shape and size description, and pictorial methods are included with emphasis on technical applications and design problem solving.

2300 Materials Engineering. (3-0) Structure, properties and behavior of engineering materials including metals, polymers, composites and ceramics. Mechanical, electrical, magnetic, thermal, and optical properties are covered. Prerequisites: MATH 1315; CHEM 1341.

3190 Cooperative Education. (0-1) Completion of technical/engineering practice-related special projects. Projects must relate to students' major and result in a term paper. Prerequisite: Approval of program coordinator.

3311 Mechanics of Materials. (3-1) This course covers the principles of mechanic materials and includes the following topics: stress and strain; elastic modulus and Poisson's ratio; constitutive equations; torsion; bending; axial, shear and bending moment diagrams; deflection of beams; and stability of columns. Prerequisite: MATH 3375.

3315 Engineering Economic Analysis. (3-0) Interest formulas, economic equivalence, rate of return analysis, techniques of economic analysis for engineering decisions and an introduction to cost estimation. Prerequisite: MATH 1315.

3360 Structural Analysis. (3-1) Structural engineering fundamentals to include design loads, reactions, force systems, functions of a structure, and the analysis of statically determinate and indeterminate structures by classical and modern techniques. Prerequisite: ENGR 3311.

3373 Circuits and Devices. (3-1) DC and AC circuit analysis, network theorems, electromechanical devices, electronic devices and an introduction to amplifiers, oscillators and operational amplifiers. Prerequisite: PHYS 2425.

4390 Internship. (0-20) Supervised on-the-job professional learning experience in engineering and other technical areas. This course provides practical work experience in their particular field of interest.

Courses in Industrial Engineering (IE)

3310 Project Planning, Scheduling, and Management. (3-0) Basic principles governing the efficient and effective management of engineering projects. Topics include project planning, scheduling, and cost estimation procedures. (WI)

3320 Engineering Statistics. (3-1) Fundamentals of probability and statistical inference for engineering applications, probability distributions, parameter estimation, hypothesis testing, and analysis of variance. Prerequisite: MATH 2472.

3330 Quality Engineering. (3-0) Quality assurance systems, quality costs, statistical quality control, and approaches for engineering quality into products and processes. Prerequisite: IE 3320.

3340 Operations Research. (3-0) This course teaches models in operations research including linear programs, the simplex method, duality theory, sensitivity analysis, integer programs, and network flows. The emphasis is in learning to recognize, formulate, solve, and analyze practical industrial problems. The course also teaches commercial mathematical programming languages. Prerequisites: CS 1428 and MATH 2472.

3360 Methods Engineering and Ergonomics. (3-0) Survey of methods for assessing and improving performance of individuals and groups in organizations. Techniques include various basic industrial engineering tools, work analysis, data acquisition and application, performance evaluation and appraisal, and work measurement procedures. Prerequisite: IE 3320 or TECH 3364.

4310 Design of Industrial Experiments. (3-0) Experimental design for engineering applications. Topics include factorial designs, fractional factorial designs, response surface methodology, evolutionary operations, and the design of robust products and processes. Prerequisite: IE 3320.

4320 Integrated Production Systems. (3-0) Basic concepts in the design and control of integrated production systems to include forecasting, inventory models, material requirements planning, scheduling, planning, and shop floor control. Coverage will include both traditional and kanban systems. Prerequisite: IE 3340.

4330 Reliability Engineering. (3-0) Reliability of components and systems, reliability models, life testing, failure analysis, and maintainability. Prerequisite: IE 3320.

4340 Optimization Techniques. (3-0) Mathematical modeling and computational methods for linear, integer, and nonlinear programming problems. Prerequisite: IE 3340.

4350 Supply-Chain Engineering. (3-0) The analysis of supply chain problems to include facility location, customer assignment, vehicle routing, inventory management, and the role of information and decision support systems in supply chains. Prerequisite: IE 3340.

4355 Facilities Planning. (3-0) Planning, design, and analysis of facilities. Emphasizes the principles and methods used for solving plant layout, facility location, material handling, automation, computer integration, and warehouse operations.

4360 Human Factors Design. (3-1) Capstone course emphasizing the applications of human factors engineering to systems design. Prerequisites: IE 3320; TECH 4345. (WI)

4370 Probabilistic Operations Research. (3-0) Probabilistic models in operations research to include queuing theory, simulation, and Markov chains. Emphasis will be placed on modeling applications to solve problems in industry and computing. Prerequisite(s): IE 3320 or MATH 3305, CS 1428.

4380 Industrial Safety. (3-0) This course is a survey of occupational safety and hazards control. Topics include the history of occupational safety; hazard sources related to humans, environment, and machines; and engineering management of hazards.

4390 Industrial Engineering Capstone Design. (3-2) Students form teams and apply industrial engineering principles to develop and implement solutions to industrial problems and/or systems engineering issues. Includes incorporation of engineering standards and realistic constraints. Prerequisite: At least two of: IE 4355, IE 3360, MFGE 4396, and IE 4370 Corequisite: At least two course from: IE 4320, IE 4350, and IE 4360.

4391 Industrial Engineering Capstone II. (2-3) Continuation of Capstone Design I (IE4390): Students complete implementation of solutions to industrial problems and/or systems

engineering issues with realistic constraints. Prerequisites: IE4390 and at least two of: IE 4355, IE 3360, MFGE 4396, and IE 4370. Corequisites: At least two course from: IE 4320, IE 4350, and IE 4360.

4399 Special Topics in Industrial Engineering. (3-0) This course will cover advanced topics that cannot be fitted into a regular course in the curriculum. Prerequisite: Faculty advisor approval.

4399A Six Sigma Methodologies. (3-0)

4399B Human Computer Interaction. (3-0)

4399C Engineering Statistics II. (3-1) This course is the continuation of IE 3320 Engineering Statistics I and covers simple and multiple regression analysis, analysis of variance, 2^k Factorial Experiments, and the use of statistical packages. Prerequisite: IE 3320.

4399D Modern Heuristic Optimization Techniques. (3-0) Heuristic methods that search beyond local optima such as simulated annealing, tabu search, genetic algorithms, ant-colony systems, and particl swarm. Papers from the literature, problem-specific heuristics, evaluation methods and serial/parallel implementations are discussed. This course is an advanced undergraduate course for students in engineering and related fields. Prerequisites: IE 3340, CS 1428.

Courses in Manufacturing Engineering (MFGE)

2132 Manufacturing Processes Lab. (0-2) Hands-on experience in variety of material removal processes such as turning, milling, drilling, and CNC machining; joining processes such as gas/arc welding, and soldering; metal casting, polymer and composite processing, and microelectronics manufacturing. Prerequisite or corequisite: MFGE 2332.

2332 Material Selection and Manufacturing Processes. (3-1) Overview of material processing, material selection and process parameter determination. Processes covered include: material removal, forming, casting, polymer processing, semiconductor manufacturing and assembly processes. Laboratory activities provide opportunities for applying the design through manufacture activities of the product cycle. Prerequisite: ENGR 2300.

3316 Computer Aided Design and Manufacturing. (3-1) Topics include design process, description of wireframe/surface/solid models, transformation and manipulation of objects, finite element analysis, data exchange, process planning, machine elements, fundamentals of numerical control programming for turning and milling processes, fundamentals of CAD/CAM systems, CNC code generation by CAD/CAM software, waterjet, and plasma cutting. Prerequisites: ENGR 1311; MFGE2332.

4355 Design of Machine Elements. (3-0) This course will cover the general procedures in designing various machine elements. These elements include shafts and flexible elements, springs, welded/riveted/brazed joints, screw fasteners, rolling/sliding contact bearings, gears, cams, and followers. Emphasis will be placed on using standard design practices. Prerequisite: ENGR 3311 or TECH 2351.

4357 Dynamics of Machinery. (3-0) This course will cover kinematics and kinetics of particles; kinematics and kinetics of rigid bodies in two and three dimensions; application of dynamics to the analysis and design of machine and mechanical components; mechanical vibrations; linkages; gear trains; and balancing of machines. Prerequisites: MATH 3323 and 3375.

4363 Concurrent Process Engineering. (2-3) Integrated design and development of products and processes; impact of ethical issues on design; the discussion of real-world engineering problems and emerging engineering issues with practicing engineers; preparation of reports; plans or specifications; cost estimation; project management, communication and the fabrication of an engineered product/system. Prerequisites: ENGR 3311, MFGE 4365, and senior standing. (WI)

4365 Tool Design. (3-1) Design of single and multi-point cutting tools, jig and fixture design, gage design, and the design of tooling for polymer processing and sheet metal fabrication. Laboratory projects will involve the use of computer aided design and rapid prototyping. Prerequisite: MFGE 3316 or ENGR 3316.

4367 Polymer Properties and Processing. (3-1) Structure, physical & mechanical properties, design considerations and processing methods for polymer-based materials are presented. Processing methods include: injection molding, blow molding, thermoforming, compression molding, extrusion, filament winding, lay-up methods, vacuum bag molding and poltrusion. Prerequisite: MFGE 2332.

4376 Control Systems and Instrumentation. (3-0) The theory of automated control systems and its applications to manufacturing systems are covered in this course. Topics covered include: modeling of systems, time and frequency domain feedback control systems, stability analysis, transducer and sensor technology and digital control. Prerequisites: PHYS 1430 and either MFGE 2332 or EE 3370. Co-requisite: MATH 3323.

4392 Microelectronics Manufacturing I. (3-0) Provides an overview of integrated circuit fabrication including crystal growth, wafer preparation, epitaxial growth, oxidation, diffusion, ion-implantation, thin film deposition, lithography, etching, device and circuit formation, packaging and testing. The laboratory component involves production and testing of a functional semiconductor device. Prerequisites: CHEM 1141 and CHEM 1341.

4394 Microelectronics Manufacturing II. (3-3) Topics include: atomic models for diffusion, oxidation and ion implantation; topics related to thin film processes i.e. CVD, PVD; planarization by chemical-mechanical polishing and rapid thermal processing; and process integration for bipolar and MOS device fabrication. Students will design processes and model them using a simulation. Prerequisite: MFGE 4392.

4395 Computer Integrated Manufacturing. (3-1) An overview of computer integrated manufacturing is presented. Topics include control strategies for manufacturing systems, automated material handling systems, production planning, shop floor control, manufacturing execution systems, manufacturing databases and their integration, data communication and protocols and man/machine interfaces. Prerequisite: MFGE 3316 or ENGR 3316 or TECH 4375. (WI)

4396 Manufacturing Systems Design. (3-2) Applications of simulation modeling to the design and analysis of manufacturing systems are presented in this course. Topics covered include queuing theory and discrete event simulation methods. Design projects will involve the use of current simulation

language for modeling and analysis of manufacturing systems. Prerequisites: IE 3320. (WI)

4399 Special Topics in Manufacturing Engineering. (3-0) This course will cover advanced topics that cannot be fitted into a regular course in the curriculum. Prerequisite: Faculty advisor approval.

4399A Reverse Engineering and Rapid Prototyping. (3-0)

4399B Introduction to Reinforced Polymer Nanocomposites in Industrial Applications. (3-0)

Department of Engineering Technology

Roy F. Mitte Building, Room 2240
T: 512.245.2137 F: 512.245.3052
www.txstate.edu/technology

Degree Programs Offered

BS, major in Concrete Industry Management
BS, major in Construction Science and Management
BST, major in Engineering Technology
BST, major in Industrial Technology
BST, major in Industrial Technology (with Teacher Certification)
BST, major in Industrial Technology-Manufacturing Technology

Minor Offered

Technology

The mission of the Department of Engineering Technology is to prepare students for technical/professional careers in industry and education. The mission is accomplished through a dedicated faculty offering programs in specialized areas with formal, technical focus. Upon graduation, students are prepared to assume positions of professional responsibility in the areas of manufacturing, construction, computer related fields of all types, electronics, and education. Fourteen well-equipped technical laboratories serve to educate students in the techniques and processes used by contemporary world class industries.

The BST in Engineering Technology provides students with the technical background to work with engineers in planning production processes, developing tooling, establishing quality assurance procedures, developing safety programs, establishing work methods, and setting time standards. Students can specialize in Electrical Engineering Technology, Construction Engineering Technology, Environmental Engineering Technology, Manufacturing Engineering Technology, and Mechanical Engineering Technology. The BST in Industrial Technology degree prepares students for work in industry in middle management positions. Students gain a sound knowledge and understanding of materials, processes, industrial safety, and concepts of industrial management. This degree has program majors in Construction, Manufacturing, and General Technology. The General Technology major, under Industrial Technology, can be customized to meet specific student needs offering opportunities in electronics, industrial safety, education, etc. Students interested in exploring such opportunities should see an Engineering Technology Department advisor for more details.
The BS in Concrete Industry Management (CIM) degree prepares students who are grounded in basic construction management, who are knowledgeable in concrete technology and techniques and who are able to manage people and systems to promote products and devices related to the concrete industry. CIM professionals find a wide array of opportunities in the concrete industry including positions in sales, operations, technical services and construction management.

Teacher Certification

A student seeking certification to teach at the secondary level must take RDG 3323; EDST 4681; and CI4370, 3325, 4332, 4343, and 4370. The student who has further questions should see the undergraduate advisor in Engineering Technology.

Bachelor of Science
Major Concrete Industry Management
(with Minor in Business Administration)
Minimum required: 123 semester hours

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	1	ENG 1320	3	ENG Literature (see general requirement 2)	3	POSI 2320	3
ENG 1310	3	HIST 1310	3	HIST 1321	3	COMM 1310	3
POSI 2310	3	BLAW 2361	3	MATH 2321	3	ACC 2301	3
ECO 2301	3	MATH 2417	4	TECH 2342	3	TECH 2313	3
CHEM 1141, 1341	4	PHYS 1410	4	PFW one course	1	PHYS 1420	4
TECH 1260	2					PFW one course	1
				Total			
Total	16	Total	17		13	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
PHIL 1305	3	ART, DAN, MU, or TH 2313	3	MKT 3343	3	ENGR 3315	3
MGT 3303	3	FIN 3325	3	CIM 3366	3	TECH 3360	3
MATH 2328	3	CIM 3330	3	CIM 4210	2	TECH 3367	3
TECH 2351	3	CIM 3340	3	TECH 4369	3	CIM 4340	3
CIM 3420	4			TECH 4345	3	CIM 4398	3
Total	16	Total	12	Total	14	Total	15

Senior Year - Summer Session	
Course	Hr
TECH 4390	3
Total	3

Bachelor of Science
Major in Construction Science and Management
Minimum required: 127 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2417; natural science- CHEM 1341/1141 and PHYS 1410; humanities and visual and performing arts component- PHIL 1320; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Effective Fall 2010: No "D" grades received at other institutions will be credited towards the major.
5. Effective Fall 2010: Students will enter the 30 semester hour Pre-Construction Curriculum, which will consist of MATH 2328, MATH 2417, CHEM 1341 &1141, PHYS 1410, PHYS 1420, TECH 1260, TECH 2313, TECH 2342 and TECH 2360. No grade lower than a "C" will be accepted and a 2.5 GPA must be maintained in these classes before a student will be allowed to enroll in advanced level Construction courses.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
TECH 1260	2	MATH 2328	3	PHYS 1420	4	COMM 1310	3
CHEM 1141, 1341	4	PHYS 1410	4	ACC 2301	3	TECH 2351	3
MATH 2417	4	TECH 2313	3	TECH 2342	3	TECH 2360	3
US 1100	1	ENG 1320	3	BLAW 2361	3	ECO 2301	3
ENG 1310	3	POSI 2320	3	PHIL 1320	3	HIST 1310	3
POSI 2310	3						
Total	17	Total	16	Total	16	Total	15

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
TECH 2160	1	TECH 3360	3	MKT 3343	3	TECH 4360	3
TECH 4313	3	TECH 3362 or 3363	3	TECH 4361	3	TECH 4364	3
TECH 2344	3	TECH 3361	3	MGT 3303	3	TECH 4368	3
TECH 3366	3	TECH 3367	3	TECH 4369	3	CIS 3317	3
ENG Literature (see gen. req. 2)	3	ART, DAN, MU, or TH 2313	3	TECH 4380	3	PFW one course	1
HIST 1320	3						
PFW one course	1						
Total	17	Total	15	Total	15	Total	13

Senior Year - Summer Session	
Course	Hr
TECH 4390	3
Total	3

Bachelor of Science in Technology
Major in Engineering Technology
(with Electrical Engineering Technology Specialization)
Minimum required: 124 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471, natural science- CHEM 1341/1141 and CHEM 1342/1142, and social science-ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	TECH 2344	3	EE 2320	3
MATH 2471	4	ENGR 2300	3	ENGR 1313	3	MATH 2425	4
US 1100	1	MATH 2472	4	PHYS 1430	4	PHYS 2425	4
ENG 1310	3	ENG 1320	3	COMM 1310	3	CS 1428	4
POSI 2310	3	HIST 1310	3	HIST 1320	3	POSI 2320	3
PFW one course	1						
Total	16	Total	17	Total	16	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
EE 3300	3	EE 3370	3	EE 4370	3	EE 3350	3
EE 3320	3	TECH 2351	3	EE 4390	3	ENGR 3315	3
IE 3320	3	ART, DAN, MU, or TH 2313	3	TECH 4345	3	MGT 4330	3
TECH 3364	3	ENG Literature (see gen. req. 2)	3	MGT 3303	3	MFGE 4376	3
ECO 2301	3	PHIL 1305	3				
PFW one course	1						
Total	16	Total	15	Total	12	Total	12

Senior Year -Summer Session	
Course	Hr
TECH 4390	3
Total	3

Bachelor of Science in Technology
Major in Engineering Technology
(with Construction Engineering Technology Specialization)
Minimum required: 124 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471, natural science- CHEM 1341/1141 and CHEM 1342/1142, and social science-ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	PHYS 1430	4	TECH 2344	3	TECH 2351	3
MATH 2471	4	CHEM 1142, 1342	4	TECH 2342	3	PHYS 2425	4
US 1100	1	MATH 2472	4	ECO 2301	3	TECH 2313	3
ENG 1310	3	ENG 1320	3	ART, DAN, MU, or TH 2313	3	COMM 1310	3
POSI 2310	3	HIST 1310	3	HIST 1320	3	POSI 2320	3
PFW one course	1						
Total	16	Total	18	Total	15	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer II		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CS 1428	4	ENGR 3315	3	TECH 4360	3	TECH 3361	3
IE 3320	3	MGT 3303	3			TECH 4345	3
TECH 3364	3	TECH 2360	3			TECH 4361	3
PHIL 1305	3	ENG Literature (see gen. req. 2)	3			ENGR 3373	3
		PFW one course	1				
Total	13	Total	13	Total	3	Total	12

Senior Year - 2nd Semester		Senior Year - Summer Session	
Course	Hr	Course	Hr
MGT 4330	3	TECH 4390	3
TECH 3360	3		
TECH 3367	3		
TECH 4364	3		
TECH 4369	3		
Total	15	Total	3

Bachelor of Science in Technology
Major in Engineering Technology
(with Environmental Engineering Technology Specialization)
Minimum required: 125 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471, natural science- CHEM 1341/1141 and CHEM 1342/1142, and social science-ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	ENGR 1313	3	CS 1428	4
MATH 2471	4	ENGR 2300	3	PHYS 1430	4	PHYS 2425	4
US 1100	1	MATH 2472	4	TECH 2344	3	ECO 2301	3
ENG 1310	3	ENG 1320	3	CHEM 2390	3	COMM 1310	3
POSI 2310	3	HIST 1310	3	HIST 1320	3	POSI 2320	3
PFW one course	1						
Total	16	Total	17	Total	16	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
IE 3320	3	TECH 4380	3	ENGR 3373	3	ENGR 3315	3
TECH 2351	3	GEO 2410	4	TECH 4330	3	TECH 4392	3
ART, DAN, MU, or TH 2313	3	MGT 3303	3	TECH 4345	3	GEO 4313	3
ENG Literature (see gen. req. 2)	3	TECH 3364	3	TECH 4367	3	MGT 4330	3
PHIL 1305	3			TECH 4350	3		
PFW one course	1						
Total	16	Total	13	Total	15	Total	12

Senior Year - Summer Session	
Course	Hr
TECH 4390	3
Total	3

Bachelor of Science in Technology
Major in Engineering Technology
(with Manufacturing Engineering Technology Specialization)
Minimum required: 124 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471, natural science- CHEM 1341/1141 and CHEM 1342/1142, and social science-ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. 6 hours of Manufacturing Engineering Technology electives – 3 hours from: TECH 1330 (fall, spring), TECH 4367 (spring), TECH 4392 (spring); and 3 hours from: TECH 4357 (spring), TECH 4374 (fall), TECH 4380 (fall, spring, summer I).

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	ENGR 1313	3	CS 1428	4
MATH 2471	4	ENGR 2300	3	PHYS 1430	4	PHYS 2425	4
US 1100	1	MATH 2472	4	TECH 2344	3	TECH 2310	3
ENG 1310	3	ENG 1320	3	ART, DAN, MU, or TH 2313	3	TECH 2351	3
POSI 2310	3	HIST 1310	3	PFW one course	1	COMM 1310	3
Total	15						
		Total	17	Total	14	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ENGR 3373	3	MGT 3303	3	TECH 4391	3	MFGE 4363	3
IE 3320	3	TECH 4362	3			TECH 3364	3
TECH 2330	3	ENG Literature (see gen. req. 2)	3			TECH 4330	3
ECO 2301	3	PHIL 1305	3			TECH 4345	3
HIST 1320	3	POSI 2320	3				
		PFW one course	1				
Total	15	Total	16	Total	3	Total	12

Senior Year - 2nd Semester		Senior Year - Summer Session	
Course	Hr	Course	Hr
ENGR 3315	3	TECH 4390	3
MGT 4330	3		
Manufacturing Engr Tech Electives (see gen. req. 4)	6		
Total	12	Total	3

Bachelor of Science in Technology
Major in Engineering Technology
(with Mechanical Engineering Technology Specialization)
Minimum required: 124 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 2471, natural science- CHEM 1341/1141 and CHEM 1342/1142, and social science-ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
CHEM 1141, 1341	4	CHEM 1142, 1342	4	ENGR 1313	3	CS 1428	4
MATH 2471	4	ENGR 2300	3	PHYS 1430	4	PHYS 2425	4
US 1100	1	MATH 2472	4	TECH 2344	3	TECH 2310	3
ENG 1310	3	ENG 1320	3	ART, DAN, MU, or TH 2313	3	TECH 2351	3
POSI 2310	3	HIST 1310	3	PFW one course	1	COMM 1310	3
Total	15						
		Total	17	Total	14	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ENGR 3373	3	TECH 4362	3	TECH 4391	3	MATH 3323	3
IE 3320	3	MGT 3303	3			MFGE 4363	3
TECH 2330	3	ENG Literature (see gen. req. 2)	3			TECH 3364	3
ECO 2301	3	PHIL 1305	3			TECH 4345	3
HIST 1320	3	POSI 2320	3				
		PFW one course	1				
Total	15	Total	16	Total	3	Total	12

Senior Year - 2nd Semester		Senior Year - Summer Session	
Course	Hr	Course	Hr
ENGR 3315	3	TECH 4390	3
MGT 4330	3		
MFGE 4376	3		
TECH 4392	3		
Total	12	Total	3

Bachelor of Science in Technology
Major in Industrial Technology
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 1317 or 2417; natural science- CHEM 1341/1141 and PHYS 1410; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Technology electives must be chosen in consultation with the departmental advisor. Electives outside of Technology should be chosen in consultation with the departmental or academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	1	CHEM 1141, 1341	4	CHEM 1142, 1342	4	PHYS 1420	4
ENG 1310	3	MATH 1317 or 2417	3-4	ENGR 2300 or TECH 2342	3	TECH Electives (see gen. req. 4)	3
POSI 2310	3	TECH Elective (see gen. req. 4)	3	PHYS 1410	4	TECH 2344	3
ECO 2301	3	ENG 1320	3	TECH Electives (see gen. req. 4)	3	TECH 2351	3
COMM 1310	3	HIST 1310	3			TECH 2370	3
ART, DAN, MU, or TH 2313	3						
Total	16	Total	16-17	Total	14	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
TECH 3364	3	TECH 4357	3	MGT 3303	3	MGT 4330	3
TECH Advanced Elective (see gen. req. 1 & 4)	6	TECH 4380	3	TECH 4345	3	TECH 4392	3
Elective (see gen. req. 4)	1-2	TECH Advanced Elective (see gen. req. 1 & 4)	3	TECH Advanced Elective (see gen. req. 1 & 4)	6	TECH Advanced Elective (see gen. req. 1 & 4)	3
HIST 1320	3	PHIL 1305	3	PFW one course	1	ENG Literature (see gen. req. 2)	3
PFW one course	1	POSI 2320	3				
Total	14-15	Total	15	Total	13	Total	12

Senior Year - Summer Session	
Course	Hr
TECH 4390	3
Total	3

Bachelor of Science in Technology
Major in Industrial Technology (with Teacher Certification)
Minimum required: 130 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 1317 and natural science- CHEM 1341/1141 and PHYS 1410. See the University College section of this catalog for the English literature and social science requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Technology electives must be chosen in consultation with the departmental advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
MATH 1317	3	CHEM 1141, 1341	4	ENGR 2300 or TECH 2342	3	PHYS 1420	4
US 1100	1	TECH 1330	3	CHEM 1142, 1342	4	TECH 2310	3
ENG 1310	3	ENG 1320	3	PHYS 1410	4	TECH 2351	3
POSI 2310	3	HIST 1310	3	TECH 2313	3	TECH 2370	3
COMM 1310	3	Social Science Component (see gen. req. 2)	3	TECH Electives (see gen. req. 4)	3	TECH elective (see gen. req. 4)	3
ART, DAN, MU, or TH 2313	3	PFW one course	1				
Total	16	Total	17	Total	17	Total	16

Sophomore Year - Summer I		Sophomore Year - Summer II		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
HIST 1320	3	POSI 2320	3	TECH 2330	3	TECH 3313	3
PFW one course	1	PHIL 1305	3	TECH 2344	3	TECH 2360	3
				TECH 4374	3	TECH 4362	3
				TECH 4380	3	TECH Advanced Electives (see gen. req. 1 & 4)	3
				CI 4332	3	CI 3325	3
Total	4	Total	6	Total	15	Total	15

Junior Year - Summer I		Junior Year - Summer II		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ENG Literature (see gen. req. 2)	3	TECH 4360	3	MGT 3303	3	EDST 4681	6
				CI 4370	3		
				CI 4343	3		
				RDG 3323	3		
							6
Total	3	Total	3	Total	12	Total	

Bachelor of Science in Technology
Major in Industrial Technology-Manufacturing Technology
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. Departmental requirements that also satisfy the general education core curriculum requirements for the following components: mathematics- MATH 1317 or 2417; natural science- CHEM 1341/1141 and PHYS 1410; and social science- ECO 2301. See the University College section of this catalog for the English literature requirements.
3. If two years of the same language are taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Technology electives must be chosen in consultation with the departmental advisor. Electives outside of Technology should be chosen in consultation with the departmental or academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
TECH 1330	3	CHEM 1141, 1341	3	CHEM 1142, 1342	4	PHYS 1420	4
US 1100	1	MATH 1317 or 2417	3-4	ENGR 1413	4	TECH 2310	3
ENG 1310	3	ENG 1320	3	ENGR 2300	3	TECH 2344	3
POSI 2310	3	HIST 1310	3	PHYS 1410	4	TECH 2351	3
COMM 1310	3	Elective (see gen. req. 4)	0-1	PFW one course	1	TECH 2370	3
ART, DAN, MU, or TH 2313	3						
Total	16	Total	14	Total	16	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Junior Year - Summer I Session		Senior Year - 1st Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
TECH 2330	3	TECH 4362	3	TECH 4391	3	TECH 4345	3
TECH 3364	3	MGT 3303	3			TECH 4374	3
TECH 4330	3	ENG Literature (see gen. req. 3)	3			TECH 4380	3
ECO 2301	3	HIST 1320	3			POSI 2320	3
PHIL 1305	3					PFW one course	1
Total	15	Total	12	Total	3	Total	13

Senior Year - 2nd Semester		Senior Year - Summer Session	
Course	Hr	Course	Hr
MGT 4330	3	TECH 4390	3
TECH 4357	3		
TECH 4373	3		
TECH advanced elective (see gen. req. 1 & 4)	3		
Total	12	Total	3

Minor in Technology

A minor in Technology requires 18 hours of Technology courses, of which 9 hours must be advanced. Courses will be determined by conference with a departmental advisor or the Chair of the Department.

Driver and Traffic Safety Education Certification

Students seeking State of Texas Certification in Driver's Education must complete nine semester hours of TECH 4383, 4385, and 4393. For more information on this program contact the Director of the Traffic Safety Center.

Courses in Concrete Industry Management (CIM)

3330 Concrete Construction Methods. (3-0) This course covers forming, shoring, placing and reinforcing operations. Transporting, placing, consolidating, finishing, jointing and curing concrete for cast-in-place foundations, pavements, slabs on ground, structural frames, and other structural members are studied. Other topics include waterproofing concrete foundations and erecting precast concrete members. Prerequisite: CIM 3420.

3340 Understanding the Concrete Construction System. (3-0) A detailed look at how the concrete construction industry works. The course includes a review of model building codes, building officials and their function, concrete industry codes and standards, concrete construction processes, quality assurance systems, contract documents, estimating, construction scheduling and concrete construction markets. Prerequisite: IE 3320 and CIM 3420.

3366 Applications of Concrete in Construction. (3-0) This course is a detailed study of the many uses of concrete in the construction of buildings, pavements and other facilities. Emphasis will be placed on the advantages, disadvantages, and unique problems faced by materials suppliers, contractors and design professionals when concrete is chosen for specific applications. Prerequisite: CIM 3330.

3420 Fundamentals of Concrete: Properties and Testing. (3-2) This course examines effects of concrete-making materials (aggregates, cements, admixtures, etc.) on the properties of fresh and hardened concrete. Concrete mixture proportioning calculations and statistical analysis of strength tests are also studied. Prerequisite: TECH 1260.

4210 Senior Concrete Lab. (1-2) This course provides students an opportunity to further develop their technical and laboratory knowledge and pursue a project of individual interest. A formal report/presentation will be required at the conclusion of the course. Prerequisite: CIM 3340, MGT 3303, FIN 3325, and BLAW 2361.

4320 Issues in Concrete and Construction Industry. (3-0) This course involves a case study approach to critically analyze various historical and current events in the concrete and construction industry. Particular emphasis will be placed upon developing a managerial decision-making process incorporating ethical, legal, financial and other business perspectives. Prerequisites: CIM 3340, MGT 3303, FIN 3325, and BLAW 2361.

4340 Concrete Problems: Diagnosis, Prevention and Dispute Resolution. (3-0) Course involves diagnosing/preventing problems related to concrete production, testing, construction and performance. Students learn to identify causes of fresh and hardened concrete problems, i.e. fast and slow setting, air content variations, low strength, cracking and scaling. Pre-job conferences and dispute resolution methods are examined. Prerequisite: CIM 3366 and 4210.

4398 Capstone. (3-0) An intensive study of a problem(s) appropriate to the major/student's career interests. Requires knowledge from previous technical/business coursework. Solution(s) for the problem(s) will be presented to an industry committee. Presentation must emphasize depth of analysis, completeness/effectiveness of solution, and presentation skills. Prerequisite: All CIM courses satisfactorily completed.

Courses in Technology (TECH)

1260 Introduction to the Construction and Concrete Industry. (2-0) An introductory course for Construction and Concrete Industry Management (CIM) majors. Residential, commercial, heavy, civil and highway construction is explored including the concrete industry. The role of the contractor, architect/engineer and owner are covered including contracts, careers, sustainability and economic importance of the construction industry.

1330 Assembly Processes. (2-2) Basic assembly process to include gas, arc, resistance, thermite, induction, and forge welding; weld-ability, weld metallurgy, weld symbology, and weld testing; brazing; soldering; mechanical fastening to include threaded fasteners, rivets, shrink and press fits, seams, staples, crimping, and structural adhesives. Principles of joint design and cost estimation. An overview of electronics assembly processes and automated assembly.

1413 Introduction to Architectural Graphics. (3-2) An introductory manual drafting course utilizing the tools and techniques necessary to produce architectural working drawings. Principles of orthographic and perspectives, projections, geometric relationships, shape and size description, and pictorial methods are included with emphasis on technical applications and architectural design problem solving. Prerequisite: Interior Design and non-Engineering or Technology majors only.

2160 Introduction to Construction Surveying and Site Layout. (1-1) Common construction surveying and site layout techniques are studied using both optical levels and total stations. Benchmarks, building lines, property lines, differential and profiling are discussed in lecture with applied exercises performed in the laboratory. Prerequisite: Pre-Construction or Instructor's Approval.

2310 Machine Drafting. (3-3) Introduction to the use of computer-aided drafting techniques (CAD) and application of basic principles of engineering drawing to the preparation of drawings for manufacturing processes. Emphasis includes principles of descriptive geometry, multiview projection, precision dimensioning, machine tooling, dies, production drawing, machine design and fabrication methods. Prerequisite: ENGR 1413 or consent of instructor.

2313 Fundamentals of Architectural Problem-Solving and Design. (2-2) Introduction to the language of architectural design. Use of the computer and CAD software in the design process. Elements of projection theory to include orthographic and perspective projection. Solving complex problems of building geometry. Section views and their relationship to

architectural detailing. Emphasis on the successful integration of construction documents.

2330 Fundamentals of Material Removal. (3-0) An overview of the micro and macro structure of materials is studied. Assessment of materials with regard to their chemical and mechanical properties and how these properties relate to machining is explored. Machining conditions with regard to feed, speed, surface finish, tooling requirements, horsepower capabilities, time, and cost analysis complete the class. Prerequisite: MATH 1315.

2342 Construction Materials and Processes. (3-1) This course will introduce students to various types of construction materials including ceramics, ferrous, non-ferrous, and organic materials used in construction. Their properties, working characteristics, and processes used to manufacture and assemble these materials are studied. Laboratory activities are used to reinforce lecture material. Prerequisite: CHEM 1341 and 1141 and PHYS 1410.

2344 Power Technology. (2-2) This class deals with understanding the basic laws of thermodynamics. It probes the issues of efficiency and examines energy-converting devices from the inputs, processes, outputs model. Internal combustion engines, electric motors, hydraulic systems, pneumatic systems, wind electric systems, solar energy systems, and gearing systems are reviewed from a practical and a theoretical perspective. Fuel analysis, lubricants, and friction all comprise essential topic areas. Prerequisite: MATH 1315.

2351 Statics and Strength of Materials. (3-0) Course covers principles of statics and strength of materials to include forces, equilibrium, friction, centroids, and stress/strain relationships, axial stress and deformation, thermal stress and deformation, stress concentrations, factor of safety, torsional stress, beam stresses and combined stress. Prerequisite: TECH 2342 or ENGR 2300 and PHYS 1410 or 1430.

2360 Residential Construction Systems. (2-2) A residential construction course, which deals with interpreting plans and specifications, along with studying site work, foundations, walls, roofing, ceilings, floor, and finishing systems. Also, residential MEP systems are covered along with applicable building codes and construction financing. Prerequisite: TECH 2342 or Instructor's Approval.

2370 (ENGR 2305) Electricity/Electronics Fundamentals. (2-2) Fundamentals of safety, Ohm's Law, series, parallel, and series-parallel circuits, meters, relays, and basic transistor circuits.

3310 Industrial Design. (3-0) The fundamentals, elements, and principles of design applied in creative ways to industrial design problems emphasizing function, form, and aesthetics. Ergonomics, product life cycles, environmental concerns, and use of elementary statics for stress analysis. (WI)

3313 Architectural Design II. (2-2) Architectural CAD techniques and principles of residential and/or light commercial design and construction. Exterior and interior drawings and details; essentials of plans, elevations, sections, and perspective aspects of architectural documents. Structural, MEP's, ADA and green-building issues are discussed. Individual and group projects will be completed by students. Prerequisite: TECH 2313.

3322 Development of Technology. (3-0) The role of technology in the development of Western World culture is studied from a technical perspective. Social repercussions resulting from the introduction of foundational technical developments are reviewed. Examples of technical areas examined are agriculture, transportation, manufacturing, engineering, defense, and communications. Readings focus discussions and papers on specific topics and encourage synthesis level understanding. (WI)

3360 Structural Analysis. (3-0) Structural engineering fundamentals to include design loads, reactions, force systems, functions of a structure, and the analysis of statically determinate and indeterminate structures by classical and modern techniques. Prerequisite: TECH 2351.

3361 Commercial Building Construction Systems. (3-0) A commercial building construction systems class that deals with soils, site work, heavy foundations, steel, reinforced concrete, and pre-cast structures along with common assemblies. Commercial MEP's are studied along with CSI master format, as-built and shop drawings, schedule of values, AIA documents, and appropriate building codes. Prerequisite: Pre-Construction or Instructor's Approval.

3362 Industrial and Offshore Construction Systems. (3-1) Management of the design process for oil and gas production facilities with emphasis on developing projects outside the United States. Presentation of materials, methods, and techniques of industrial facility construction and marine environments centers on equipment and crew selection, productivity, cost estimation, and constructability. Required field trip. Prerequisite: Pre-Construction or Instructor's Approval.

3363 Heavy, Civil, and Highway Construction Systems. (3-1) Selection, acquisition, and capabilities of heavy construction equipment are presented. Applications of economics to performance characteristics and production of equipment is discussed. Sector-specific construction management methods are covered, including unit price estimating, equipment fleet design, repetitive scheduling, and major components of highways, bridges, and engineered facilities. Prerequisite: Pre-construction or Instructor's Approval.

3364 Quality Assurance. (3-0) This course covers the principles of quality management to include basic probability and statistics concepts, control charts for attributes and variables, sampling plans, quality audits and costs. The laboratory component of this class includes exercises that provide exposure to basic metrology and data collection.

3366 Soils and Foundation. (3-0) Properties of subsurface materials and the principles of subsurface construction are studied. Topics include soil classification and testing, soil mechanics and foundation systems, including site layout, excavation, caissons, piles, slurry wall, slab and spread footings. Prerequisite: Pre-Construction and TECH 2351 or instructor approval.

3367 Mechanical, Electrical, and Plumbing Systems. (3-1) This course covers typical Mechanical, Electrical and Plumbing (MEPs) systems found in residential and commercial construction along with design and installation methods used to conserve both energy and water in new and remodeled structures. Prerequisites: TECH 2313, 2342, and 2360 or permission from the instructor.

3370 Audio Frequency Communications. (2-2) A study of the characteristics of basic electronic circuits and their component

parts. Course content includes the use of electronic test equipment, inductance, capacitance, reactance, impedance, rectification, switching, amplification, and electronic circuit fabrication. Prerequisite: TECH 2370.

4197 Special Problems. (1-0) The investigation of a special topic by developing the problem, researching the topic, and presenting the findings as they apply to industry/technology. This course will be applicable to all areas of technology, and must be done only with the approval of the cooperating faculty member and Department Chair. Repeatable for credit with different emphasis.

4310 Technical Architectural Drafting. (3-3) Architectural plans, renderings, and detailing including case, millwork and cabinet detailing concepts are taught in this class using contemporary computer aided design (CAD) software. Repeatable for credit with different emphasis. Prerequisite: ENGR 1413 or TECH 1413.

4313 Advanced Architectural Design. (2-2) Architectural CAD techniques and principles of commercial construction. Exterior and interior drawings and details; essentials of plans, elevations, sections, and perspective aspects of architectural documents. Structural, mechanical, electrical, plumbing, ADA and green building issues are discussed. Design and/or construction documents will be produced through group participation projects. Prerequisite: TECH 2313.

4321 Flight Instruction Academics. (3-0) Provides instruction necessary to pass the Federal Aviation Administration written examination in order to fulfill academic requirements for a private pilot's license. Includes instruction in: Aircraft Pre-Flight; Flight and System Controls; Federal Aviation Agency Regulations; Navigation; Weather; Weight and Balance; Radio Communications; and Airman Information Manual.

4330 Foundry and Heat Treatment. (3-3) The technical aspects of foundry and heat treatment of ferrous and non-ferrous metals are reviewed. Students gain proficiency with interpretation of binary phase diagrams, mathematical modeling of gate and runner systems, micro-structural analysis, process cost evaluation, sand testing, investment casting and other technical processes. Technical report writing is an important part of this class. Data collection and data analysis with experiments allow students to develop appropriate techniques for presenting technical data in report format. ENGR 2300 recommended. (WI)

4345 Methods Engineering and Ergonomics. (3-0) Principles and procedures of methods engineering to include concurrent engineering, charting techniques, motion analysis, principles of motion economy, human factors, direct time study, standard data systems, predetermination time standards and work sampling.

4357 Facilities Design. (3-0) Survey and application of the principles and methods used for solving plant layout and material handling problems in industry.

4360 Construction Contract Administration. (2-2) Construction contracts including lump sum and cost reimbursable are covered, along with delivery systems, insurance, bonding, AIA documents, specifications, addenda, general conditions, change orders, RFI's Mechanical, Electrical and Plumbing Systems and ethics are covered. Selected modules are designed, scheduled, and built, complete with specifications. Prerequisite: Pre-Construction or Instructor's Approval.

4361 Construction Estimating. (2-2) The fundamentals of construction estimating are covered including feasibility, conceptual, square feet, cubic feet, unit in place, preliminary, engineering, range and contractor's detail bid estimates. Plans and specifications are used along with contemporary estimating software to develop estimates commonly used in the construction industry. Prerequisite: Pre-Construction and TECH 3361 or Instructor's Approval.

4362 Manufacturing Processes I. (1-3) Application of metal cutting principles learned in 2330. Included in the requirements are steel rule dye layout, machine layout, tool life, tool wear, tool geometry and reconditioning, feed and speed principles, metal removal rates, and power consumption calculations. Machining steel as well as castings produced in the laboratory with various types of cutting tool materials and varying geometry contributes toward the wide variety of experiences included in this basic manufacturing course. Plain indexing activities complement basic machine operations in a unique and most unusual way. Prerequisite: TECH 2330.

4364 Construction Project Management and Scheduling. (3-1) Concepts of construction management are studied beginning with contract documents through the effective management of manpower, machines, material, and money necessary to complete construction projects on time and within budget. Gantt Charts and PERT/CPM schedules are developed, using contemporary software. Prerequisite: Pre-Construction and TECH 4361 or Instructor's Approval.

4367 Polymer Properties and Processing. (3-1) Structure, physical & mechanical properties, design considerations and processing methods for polymer-based materials are presented. Processing methods include: injection molding, blow molding, thermoforming, compression molding, extrusion, filament winding, lay-up methods, vacuum bag molding and poltrusion. Prerequisite: ENGR 2300.

4368 Environmentally Conscious Design and Construction. (3-1) Environmentally sustainable practices used in building design and construction. The LEED system will be used to guide the course, which covers aspects of sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and the CAD design process. Prerequisite: Pre-Construction or ID 2329 and TECH 2313 or Instructor's Approval.

4369 Construction Contracts, Liability, and Ethics. (3-0) Legal aspects of design and construction contract documents are presented, including contract formation, interpretation, rights and duties, and changes. Legal liabilities are explored in the context of professional ethics for design firms and constructors. Prerequisite: Pre-Construction and recommended: MGT 3303 and/or MG 3360 or Instructor Approval.

4372 Electronic Instrumentation. (2-2) Transistor configurations, field effect transistors and circuits, voltage regulation, amplifier feedback principles, operational amplifiers and circuitry, and unijunction transistors and applications. Prerequisite: TECH 2370.

4373 Industrial Electronics. (2-2) A study of control systems, electrical switching, electrical generation, motors, wiring, illumination, and temperature controls as they apply to industry. Electronic product development and manufacturing are studied through classroom and laboratory activities. Prerequisite: TECH 2370.

4374 Digital Electronics. (2-2) Solid state digital electronics from basic concepts to current industrial needs in terms of logic gates (all types), number systems counters (all types), registers (all types), sequential control circuits, and shift register generator. Prerequisite: TECH 2370 or PHYS 2425.

4380 Industrial Safety. (3-0) Introduction to the field of industrial safety with emphasis on compliance with Federal and State regulations. (WI)

4383 Driver and Traffic Safety Education I. (3-0) Content, methods, and materials for instruction in the classroom phase of driver education in Texas. Topics include Texas traffic law; Texas Education Agency standards for high school driver education; driver behavior, attitude, and psychomotor skills; and safety in the highway transportation system.

4385 Driver and Traffic Safety Education II. (3-3) Content, methods and materials for instruction in the laboratory phase of driver education in Texas. Topics include in-car instruction, multi-car range, and simulation. During laboratory sessions participants will observe in-car instructors, peer teach in the car, and teach a high school student how to drive. TECH 4383 and 4385 will be taken simultaneously. Prerequisites: TECH 4383 and a good driving record.

4387 Motorcycle Safety and Rider Education. (3-3) Techniques and methods of teaching beginner rider education. Includes classroom techniques as well as laboratory experience in on-street and off-street riding. Not applicable to the BS in Technology program.

4390 Internship. (0-20) Supervised on-the-job professional learning experience in construction, manufacturing, electronics, and other technical areas. This course provides practical work experience in their particular field of interest. Repeatable for credit. Prerequisites: Consult internship coordinator. (WI)

4391 Manufacturing Processes II. (1-3) Involves a wide variety of advanced manufacturing techniques. Included are the following areas: differential indexing, electrical discharge machining, precision grinding, specialized thread cutting, high energy rate forming, tool grinding, tool behavior analysis, tool cost evaluation, and numerical control programming. An emphasis may be placed on certain processes mentioned above in order to meet the specific needs of various classes. Prerequisites: TECH 2330, 4362; MATH 1315.

4392 Microelectronics Manufacturing I. (3-0) Provides an overview of integrated circuit fabrication including crystal growth, wafer preparation, epitaxial growth, oxidation, diffusion, ion-implantation, thin file deposition, lithography, etching, device and circuit formation, packaging and testing. Lab component involves production and testing of a functional semiconductor device.

4393 Driver and Traffic Safety Education III. (3-3) Content, procedures, and administration of multi-phase driver education programs. Topics include scheduling, maintenance and operation of laboratory equipment, record keeping, lesson plan development, and driver education for the handicapped. Practicum in classroom and/or simulation instruction. Not applicable to the Bachelor of Science in Technology degree program. Prerequisite: TECH 4383, 4385, and TECH 4393 may be taken simultaneously.

4394 Microelectronics Manufacturing II. (3-0) This is an intermediate level course in integrated circuit processing. Topics covered include: atomic models for diffusion, oxidation and ion implantation; topics related to thin film processes such as chemical vapor deposition, physical vapor deposition; planarization by chemical-mechanical polishing and rapid thermal processing; and process integration for bipolar and MOS device fabrication. Students will design processes and model them using a simulation tool such as SUPREM.

4397 Special Problems. (3-0) The investigation of a special topic by developing the problem, researching the topic, and presenting the findings as they apply to industry/technology. This course will be applicable to all areas of technology, and must be done only with the approval of the cooperating faculty member and Department Chair. Repeatable for credit with different emphasis.

4399 Seminar in Technology. (3-0) The topics for this course will vary. The course will involve the identification of the topic, its nomenclature, its processes, tools, equipment or materials, and its application to technology. The topic may apply to either the certification program or technology program or to both. A final report summary or presentation will conclude each seminar. Repeatable for credit with different emphasis.

Department of Mathematics

Math/Computer Science Building 470
T: 512.245.2551 F: 512.245.3425
www.txstate.edu/math/welcome.html

Degree Programs Offered

BS, major in Applied Mathematics
BA, major in Mathematics
BS, major in Mathematics
BS, major in Mathematics (with Teacher Certification)

Minor Offered

Applied Mathematics
Mathematics

The study of mathematics is more than four thousand years old and comprises an enormous body of knowledge. Mathematics remains a very active area of research continually giving rise to new theories and questions. The knowledge accumulated and the questions being considered concern both mathematics itself and its many applications.

Mathematics is a fundamental skill required at some minimal level of all educated people, and required in depth in many professions. The teaching objective of our Department includes the development of reasoning and computations skills, and the preparation of students for careers requiring a significant mathematical background.

Majors

The department offers the Bachelor of Arts and the Bachelor of Science majors in Mathematics with or without teacher certification and the Bachelor of Science with a major in Applied Mathematics. Any major requires 17 credit hours in core courses and 15 additional credit hours, which vary with the student's program. See the degree plans below.

For the BA or BS, a major in mathematics requires at least 38 semester hours, including MATH 2471, 2472, 3330, 3377, 3380, 4307 and 18 semester hours of advanced mathematics. The eighteen hours must follow one of two plans. The first consists of 3373, 4315, and 4330 plus any three of the following courses: 3305, 3323, 3325, 3348, 3375, 3398, 4305, 4306, 4336, or 4382. The second is the certification plan and consists of 3305, 3315, 4304 and 4311 plus any two of the following courses: 3323, 3325, 3373, 4305, 4315 or 4330. Notice that MATH 3315, 4302, 4303, 4304 and 4311 are not in the list of elective courses when taking the plan that includes MATH 3373. Even though MATH 2471 is the first required mathematics course, some students will need to take courses numbered below 2471. Credit examinations in MATH 1315, 2417, and 2471 are available.

For the BS, a major in applied mathematics requires at least 38 semester hours, including Math 2358, 2471, 2472, 3305, 3323, 3330, 3373, 3377, 3380 and 9 semester hours from Math 3348, 3375, 3398, 4305, 4306, 4307, 4315, 4336.

Teacher Certification

A student seeking certification to teach at the secondary level must take RDG 3323; EDST 4681; and CI 3325, 4332, 4343, and 4370. The student who has further questions should see the undergraduate advisor in Mathematics.

For students who are seeking teacher certification within their major and are not in the College of Science, but would like a second teaching field in Mathematics (Texas Grades 8-12) the requirements are: MATH 2471, 2472, 3305, 3315, 3330, 3377, 3380, 4304, and 4307.

Bachelor of Science
Major in Applied Mathematics
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements. PHYS 1430 is highly recommended as one of the 7-8 hours of natural science since it is a prerequisite for MATH 3375 in the advanced MATH electives.
3. If two years of the same foreign language were taken in high school, then no additional language hours required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Even though MATH 2471 is the first required mathematics course, some students will need to take courses numbered below 2471. Credit examinations in MATH 1315, 2417, and 2471 are available.
5. At least 38 hours are required in mathematics. and must include MATH 2358, 2471, 2472, 3305, 3323, 3330, 3373, 3377, 3380 and 9 semester hours of advanced mathematics from the following courses: MATH 3348, 3375, 3398, 4305, 4306, 4307, 4315 or 4336.
6. See the list of minors under the Degrees and Programs section of this catalog. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	3	MATH 2472	4	MATH 3373	3	MATH 3305	3
ENG 1310	1	ENG 1320	3	Minor (see gen. req. 6)	3	Minor (see gen. req. 6)	3
POSI 2310	3	HIST 1310	3	Natural Science Component (see gen. req. 2)	4	CS 1428	4
COMM 1310	3	Natural Science Component (see gen. req. 2)	3-4	MATH 2358	3	ENG Literature (see gen. req. 2)	3
MATH 2471	4	PHIL 1305	3	PFW one course	1	MATH 3323	3
Social Science Component (see gen. req. 2)	3						
Total	17	Total	16-17	Total	14	Total	16

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ART, DAN, MU, or TH 2313	3	MATH 3377	3	MATH 3380	3	MATH Advanced Elective (see gen. req. 5)	3
MATH 3330	3	MATH Advanced Elective (see gen. req. 5)	3	Minor (see gen. req. 1 & 6)	3	MATH Advanced Elective (see gen. req. 5)	3
CS 2308	3	Minor (see gen. req. 1 & 6)	3	Electives (see gen. req. 1,3,4 & 6)	3-4	Minor (see gen. req. 1 & 6)	3
Minor (see gen. req. 1 & 6)	3	POSI 2320	3	ENG 3303	3	Electives (see gen. req. 1,3,4 & 6)	3
HIST 1320	3	Electives (see gen. req. 1,3,4 & 6)	3	PFW one course	1		1
Total	15	Total	15	Total	13-14	Total	13

Bachelor of Arts
Major in Mathematics
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. Even though MATH 2471 is the first required mathematics course, some students will need to take courses numbered below 2471. Credit examinations in MATH 1315, 2417 and 2471 are available.
4. At least 38 hours are required in mathematics, and must include MATH 2471, 2472, 3330, 3373, 3377 3380, 4307, 4315, and 4330; and nine hours of advanced mathematics from the following courses: MATH 3305, 3323, 3325, 3348, 3375, 3398, 4305, 4306, 4336, or 4382.
5. See the list of minors under the Degrees and Programs section of this catalog. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	3	MATH 2472	4	MATH 3373	3	ART, DAN, MU, or TH 2313	3
ENG 1310	1	ENG 1320	3	Minor (see gen. req. 6)	3	MATH Advanced Elective	3
POSI 2310	3	HIST 1310	3	Modern Language 1410	4	CS 1428	4
COMM 1310	3	Natural Science Component (see gen.		Natural Science Component (see gen.		Modern Language 1420	4
MATH 2471	4	req. 2)	3	req. 2)	4	ENG Literature (see gen.	
Social Science Component (see gen.		PHIL 1305	3	PFW one course	1	req. 2)	3
req. 2)	3						
Total	17	Total	16	Total	15	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
MATH 3377	3	MATH 3380	3	MATH 4330	3	MATH 4307	3
MATH 3330	3	MATH Advanced Elective (see gen.		Minor (see gen. req. 1 & 5)	6	MATH 4315	3
Minor (see gen. req. 1 & 5)	3	req. 4)	3	PFW one course	1	Minor (see gen. req. 1 & 5)	3
Modern Language 2310	3	Minor (see gen. req. 1 & 5)	3	Second ENG Literature (see gen.		MATH Advanced Elective	3
HIST 1320	3	Modern Language 2320	3	req. 2)	3		
		POSI 2320	3				
					13	Total	
Total	15	Total	15	Total			12

Bachelor of Science
Major in Mathematics
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Even though MATH 2471 is the first required mathematics course, some students will need to take courses numbered below 2471. Credit examinations in MATH 1315, 2417 and 2471 are available.
5. At least 38 hours are required in mathematics and must include MATH 2471, 2472, 3330, 3373, 3377, 3380, 4307, 4315, and 4330; and nine hours of advanced MATH from the following courses: MATH 3305, 3323, 3325, 3348, 3375, 3398, 4305, 4306, 4336, or 4382.
6. The fourth English course may be sophomore level English Literature or ENG 3303 Technical Writing.
7. See the list of minors under the Degrees and Programs section of this catalog. Minor and electives should be chosen in consultation with the academic advisor.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	1	MATH 2472	4	MATH 3373	3	MATH 3330	3
ENG 1310	3	ENG 1320	3	Minor (see gen. req. 7)	3	Minor (see gen. req. 7)	3
POSI 2310	3	HIST 1310	3	Natural Science Component (see gen. req. 2)	4	CS 1428	4
COMM 1310	3	Natural Science Component		Electives (see gen. req. 1,3, 4 & 7)	3	ENG Literature (see gen. req. 2)	3
MATH 2471	4	(see gen. req. 2)	3-4	PFW one course	1	MATH 3377	3
Social Science Component (see gen. req. 2)	3	PHIL 1305	3				
Total	17	Total	16-17	Total	14	Total	16

Junior Year - 1st Semester		Junior Year - 1st Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
ART, DAN, MU, or TH 2313	3	MATH Adv Elective (gen. req. 6)	3	MATH 4330	3	MATH 4307	3
MATH 3380	3	MATH Advanced Elective (see gen. req. 6)	3	MATH Adv Elective	3	MATH 4315	3
Minor (see gen. req. 1 & 7)	3	Minor (see gen. req. 1 & 7)	3	Electives (see gen. req. 1,3,4 & 7)	3	Minor (see gen. req. 1 & 7)	3
HIST 1320	3	POSI 2320	3	Fourth English course (see gen.		Electives (see gen. req. 1,3 & 7)	4-5
Electives (see gen. req. 1,3,4 & 7)	3	Electives (see gen. req. 1,3,4 & 7)	3	req. 1, 2 & 6)	3		
				PFW one course	1		
Total	15	Total	15	Total	13	Total	13-14

Bachelor of Science
Major in Mathematics
(with Teacher Certification)
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same language were taken in high school, then no additional language hours will be required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. Even though MATH 2471 is the first required mathematics course, some students will need to take courses numbered below 2471. Credit examinations in MATH 1315, 2417 and 2471 are available. Electives should be chosen in consultation with the academic advisor.
5. At least 38 hours are required in mathematics and must include MATH 2471, 2472, 3305, 3315, 3330, 3377, 3380, 4304, 4307 and 4311 and six hours from: MATH 3323, 3325, 3373, 4305, 4315, 4330.
6. The fourth English course may be sophomore level English Literature or ENG 3303 Technical Writing.
7. A minor in Secondary Education is required.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
US 1100	1	MATH 2472	4	MATH 3330	3	MATH 3305	3
ENG 1310	3	CS 1428	4	MATH 3315	3	MATH 3377	3
POSI 2310	3	ENG 1320	3	Natural Science Component (see gen. req. 2)	3-4	COMM 1310	3
MATH 2471	4	HIST 1310	3	Electives (see gen. req. 1,3 & 4)	4-5	Electives (see gen. req. 1,3 & 7)	3
Social Science Component (see gen. req. 2)	3	PHIL 1305	3	PFW one course	1	Natural Science Component (see gen. req. 2)	4
Total	14	Total	17	Total	15	Total	16

Sophomore Year - Summer I		Sophomore Year Summer II		Junior Year - 1st Semester		Junior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
HIST 1320	3	POSI 2320	3	MATH 3380	3	MATH 4307	3
ENG Literature (see gen. req. 2)	3			MATH 4311	3	MATH 4304	3
				CI 4332	3	CI 3325	3
				MATH Adv Elective	3	MATH Adv Elective	3
				ART, DAN, MU, or TH 2313	3	Fourth English course (see gen. req. 6)	3
						PFW one course	1
Total	6	Total	3	Total	15	Total	16

Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr
CI 4370	3	EDST 4681	6
CI 4343	3		
RDG 3323	3		
Electives (see gen. req. 1,3 & 4)	3		
Total	12	Total	6

Minor in Applied Mathematics

A minor in Mathematics requires at least 20 hours, including MATH 2471, 2472 and the remaining courses from this list: MATH 3305, 3323, 3348, 3373, 3375, 3377, 3398, 4306, PHYS 3320, CS 3378, or IE 3320.

Students can take only one of: PHYS 3320, CS 3378, or IE 3320 and students may not receive credit for both MATH 3305 and IE 3320.

Minor in Mathematics

A minor in Mathematics requires at least 20 hours, including MATH 2471, 2472 and the remaining courses from this list: MATH 3305, 3323, 3325, 3330, 3348, 3373, 3377, 3380, 3398, 4305, 4306, or 4307.

Courses in Mathematics (MATH)

1300 Pre-College Algebra. (1-3) A course to remediate and review basic academic skills in mathematics, including number concepts, computation, elementary algebra, geometry and mathematical reasoning. MATH 1300 will not constitute a part of the hours required for a bachelor's degree.

1311 Basic Mathematics. (1-3) A preparatory course for college algebra. Topics include linear equations and inequalities, rational expressions, exponents and radicals, quadratics and word problems. This course is designed for students who have graduated from high school with no more than the minimum mathematics requirements or for students who have been away from mathematics for a number of years. Prerequisite: MATH 1300 with a grade of CR, ACT Mathematics score of 15 or more, SAT Mathematics score of 400 or more, Accuplacer Elementary Algebra score of 59 or more, Compass Algebra score of 35 or more.

1315 (MATH 1314) College Algebra. (3-0) A course covering linear and quadratic equations, inequalities, word problems, functions, logarithms, systems of equations and other college algebra topics as time permits. Prerequisite: MATH 1311 with a grade of CR or a grade of C or higher, ACT Mathematics score of 21 or more, SAT Mathematics score of 480 or more , Accuplacer College Mathematics score of 63 or more, Compass Algebra score of 66 or more.

1316 A Survey of Contemporary Mathematics. (3-0) A study of the uses of mathematics in society today. Emphasis is on concepts rather than technical details. May not be used as a prerequisite for any other mathematics course. Prerequisite: MATH1311 with a grade of CR or a grade of C or higher, ACT Mathematics score of 21 or more, SAT Mathematics score of 480 or more, Accuplacer College Mathematics score of 63 or more, Compass Algebra score of 66 or more.

1317 (MATH 1316) Plane Trigonometry. (3-0) A course covering trigonometric functions, right triangles, radian measure, graphs of trigonometric functions, trigonometric identities, including multiple and half-angle identities, inverse trigonometric functions, trigonometric equations, oblique triangles, and complex numbers. Prerequisite: MATH 1315 with a grade of C or higher, Accuplacer College Mathematics score of 86 or more, Compass College Algebra score of 46 or more.

1319 (MATH 1324) Mathematics for Business and Economics I. (3-0) Topics from college algebra and finite mathematics which apply to business and economics including applications of equations and inequalities, simple and compound interest and annuities. Prerequisite: Math 1311 with a grade of CR or a grade of C or higher, ACT Mathematics score of 21 or more, SAT Mathematics score of 480 or more, Accuplacer College Mathematics score of 63 or more, Compass Algebra score of 66 or more.

1329 (MATH 1325) Mathematics for Business and Economics II. (3-0) Topics from finite mathematics and elementary differential calculus which apply to business and economics. Prerequisite: MATH 1315 or 1319 with a grade of C or higher, ACT Mathematics score of 27 or more, SAT Mathematics score of 580 or more, Accuplacer College Mathematics score of 86 or more, Compass College Algebra score of 46 or more.

2311 (MATH 1350) Principles of Mathematics I. (3-0) Logical deductive reasoning, number theory, a rational development of the real numbers with the associated number structures and algorithms for the fundamental operations, including historical, philosophical and cultural significance. Prerequisite: MATH 1315 with a grade of "C" or higher.

2312 (MATH 1351) Informal Geometry. (3-0) Geometric measuring. Euclidean Geometry, and topics associated with informal geometry, including historical, philosophical, and cultural significance. Prerequisite: MATH 2311 with a grade of "C" or higher.

2321 (MATH 2313) Calculus for Life Sciences I. (3-0) This course is designed to serve the needs of students in the life sciences. Topics will include: graphs, derivatives, exponents and logarithms, scientific notation, sequences, summation, and applications. Prerequisite: MATH 1315 with a grade of C or higher, ACT Mathematics score of 24 or more, SAT Mathematics score 520 or more, Accuplacer College Mathematics score of 86 or more, Compass College Algebra score of 46 or more.

2328 (MATH 2342) Elementary Statistics. (3-0) Algebra-based introduction to descriptive statistics, random sampling, design of experiments, probability and the Central Limit Theorem. Inferential statistics topics include the foundational concepts for confidence intervals and hypothesis testing for simple experiments. Prerequisite: MATH 1315 with a grade of "C" or higher.

2331 Calculus for Life Science II. (3-0) Extension of MATH 2321. Topics will include: trigonometric functions, probability, integral calculus, differential equations, and applications. Prerequisite: MATH 2321 with a grade of "C" or higher.

2358 (MATH 2305) Discrete Mathematics I. (3-0) A study of discrete mathematical structures that are commonly encountered in computing hardware and software. Prerequisite: MATH 1315 with a grade of "C" or higher.

2417 (MATH 2412) Pre-Calculus Mathematics. (3-2) A survey of functions, trigonometry and analytic geometry to prepare students for calculus. Prerequisite: MATH 1315 with a grade of C or higher, ACT Mathematics score of 24 or more, SAT Mathematics score of 520 or more, Accuplacer College Mathematics score of 86 or more, Compass College Algebra score of 46 or more.

2471 (MATH 2413) Calculus I. (3-2) A first course in differential and integral calculus which stresses limits as well as the applications of calculus to the problems of science. Prerequisite:

MATH2417 with a grade of C or higher, ACT Mathematics score of 26 or more, SAT Mathematics score of 560 or more, Accuplacer College Mathematics score of 103 or more, Compass Trigonometry score of 46 or more.

2472 (MATH 2414) Calculus II. (3-2) A continuation of differential and integral calculus including methods of integration, sequences and series, and introduction to partial derivatives. Prerequisite: MATH 2471 with a grade of "C" or higher.

3305 Introduction to Probability and Statistics. (3-0) Basic probability models, generating functions and conditional probability, also discrete and continuous, univariate and bivariate distributions of random variables. Concepts of estimation, tests of hypothesis and statistical inference. Prerequisite: MATH 2472 with a grade of "C" or higher.

3315 Modern Geometry. (3-0) Modern geometry with an emphasis on the triangle, circle, plane and Euclidian geometry, an historical aspects will be integrated into the course. May not be applied toward a minor in mathematics. Prerequisites: MATH 2321 or 2471 with a grade of "C" or higher.

3323 Differential Equations. (3-0) A course covering solutions to the more common types of ordinary differential equations, especially those of first and second order, with emphasis on geometrical and physical interpretations. Prerequisite: MATH 2472 with a grade of "C" or higher.

3325 Number Systems. (3-0) Algebraic construction of the natural numbers. Covers the basic vocabulary and proof techniques of abstract algebra, and the structural properties of the natural numbers, integers, rational, real and complex number systems. Prerequisite or Co-requisite: MATH 2471.

3330 Introduction to Advanced Mathematics. (3-0) An introduction to the theory of sets, relations, functions, finite and infinite sets, and other selected topics. Algebraic structure and topological properties of Euclidean Space, and an introduction to metric spaces. Prerequisite: MATH2472 with a grade of C or higher.

3348 Deterministic Operations Research. (3-0) This course provides a broad view of deterministic operations research techniques. Topics include dynamic programming, linear and integer programming, deterministic inventory models, and sequencing problems. Prerequisite: MATH2472 with a grade of C or higher.

3373 Calculus III. (3-0) A course covering sequences and series, vectors, functions of several variables, partial derivatives, multiple integrals, line and surface integrals, and applications. Prerequisite: MATH 2472 with a grade of "C" or higher.

3375 Engineering Mechanics. (3-0) A course covering statics, using a vector approach to mechanics. The course is designed to satisfy the requirements of engineering Colleges. Prerequisite: PHYS 1430. Prerequisite or Co-requisite: MATH 2472.

3377 Linear Algebra. (3-0) An introductory course in linear algebra covering vector spaces, linear transformation, matrices, systems of linear equations, and inner product spaces. Prerequisite: MATH 2472 with a grade of "C" or higher.

3380 Analysis I. (3-0) A course covering the introduction to the theory of real functions. Topics include limits, continuity and derivatives and associated topics. Prerequisite: MATH 3330 with a grade of "C" or higher.

3398 Discrete Mathematics II. (3-0) A continuation of discrete Mathematics I. Prerequisite: MATH 2358 with a grade of "C" or higher.

4302 Principles of Mathematics II. (3-0) Algebraic reasoning and probability with selected topics from quantitative reasoning, measurement, statistics, and geometry are integrated with middle school pedagogical practices such as inquiry learning and use of technology. Appropriate correlated lessons, writing components, and culturally responsive teaching are incorporated. Prerequisite: MATH 2312 with a grade of "C" or higher.

4303 Capstone Mathematics for Middle School Teachers. (3-0) A rigorous, integrated, analytical perspective of mathematical topics; quantitative reasoning, geometry and measurement, probability and statistics, number theory and algebraic reasoning. May not be applied towards a mathematics minor. Must be taken before student teaching. Prerequisites: Math 2331 or 2472 and Math 3315 with grades of "C" or higher.

4304 Math Understandings. (3-0) Basic concepts underlying algebra, geometry, trigonometry, and calculus taught from an advanced standpoint, including historical, philosophical, and cultural significance. May not be applied toward a minor in mathematics. Must be taken before student teaching. Prerequisite: MATH 3315 and 2331 or 2472 with grades of "C" or higher.

4305 Probability and Statistics. (3-0) A course covering sample spaces, probability of events, binomial and multinomial distributions, random variables, normal approximations, statistical inference, and applications. Prerequisite: MATH 3305 with a grade of "C" or higher.

4306 Fourier Series and Boundary Value Problems. (3-0) Advanced solution methods for differential equations; partial differential equations; series approximations, Fourier series; boundary value problems typical of scientific applications. Prerequisite: MATH 3323 with a grade of "C" or higher.

4307 Modern Algebra. (3-0) A course covering elementary set theory, structures, functions, and concepts of modern algebra. Prerequisites: MATH 3330 with a grade of "C" or higher and MATH 3325 or 3377 with a grade of "C" or higher.

4311 Introduction to the History of Mathematics. (3-0) A survey of the development of major mathematical topics, including geometry, algebra, calculus, and advanced mathematics. Philosophical and cultural aspects will be integrated with the structure, theorems, and applications of mathematics. May not be applied toward a minor in mathematics. Prerequisite: MATH 3315 with a grade of "C" or higher and MATH 2331 or 2472 with a grade of "C" or higher. (WI)

4315 Analysis II. (3-0) A continuation of MATH 3380. Topics include integration, series and sequences of functions and associated topics. Prerequisite: MATH 3380 with a grade of "C" or higher.

4330 General Topology. (3-0) Topics include introductory treatment of convergence, continuity, compactness, connectedness and fixed points in topological spaces with special emphasis on metric spaces. Prerequisite: MATH 3330 or 3380 with a grade of "C" or higher.

4336 Studies in Applied Mathematics. (3-0) Selected topics including Laplace transforms, complex variables, advanced calculus for applications, calculus of variations, integral

equations, intermediate differential equations, vector analysis, etc. May be repeated once for credit with a different topic. Prerequisite: Consent of instructor.

4382 The Literature and Modern History of Mathematics and Its Applications. (3-0) This course will focus on mathematical articles in recent journals. The articles will be re-written so that the proofs and comments are more easily understood by the casual reader. This embellishment of journal articles will take place in class with the class participating, in groups for outside work and as individual assignments. May not be applied toward a minor in mathematics. Prerequisites: A grade of "C" or higher in two of these three: MATH 3380, 4307, or 4330. (WI)

Department of Physics

Roy F. Mitte Building, Room 3240
T: 512.245.2131 F: 512.245.8233
www.physics.txstate.edu

Degree Programs Offered

BA, major in Physics
BS, major in Physics

Minor Offered

Physics

Physics, the study of matter and energy, is at the root of every field of natural science and underlies all physical phenomena. The problem-solving skills learned in the study of physics are valuable even if one's career is not in a physics-related field.

The BS with a major in Physics provides a rigorous background in physics as a preparation for graduate studies or a career in industry. The BA with a major in Physics is for students who want a background in physics but plan to pursue fields of interest other than physics as a life's work.

Career opportunities for a physics major exist in a wide variety of settings-from teaching in a classroom to basic research in an industrial or government laboratory, as a self-employed consultant, or as a member of a multidisciplinary research team.

Students who enter Texas State needing mathematics at a level below MATH 2417 are urged to attend a summer session to avoid any delay in starting their physics courses.

Pre-Engineering: There are two pre-engineering options offered through the Department of Physics for those students who want an engineering program that is not currently offered at Texas State. Option 1: Called a 3-2 option in which students spend approximately six semesters in a physics and mathematics curriculum. The student must complete at least 96 hours of prescribed work that is required by the Department. All of the prescribed course work must be earned in residence or as dual credit, IB, or AP credit prior to enrollment at Texas State. A student who is approved to be in the 3-2 pre-engineering program and who later earns an engineering degree from an approved engineering school in the state of Texas may be granted a bachelor's degree by Texas State. The student must (1) satisfy all general education core curriculum requirements, (2) satisfy all prescribed coursework for the major and minor, and (3) request a degree audit in the College of Science Advising Center before leaving Texas State. After completing the entire program, students receive both an engineering degree from the school they attended and a BS in Physics from Texas State. Option 2: Students spend three to six semesters taking courses basic to the field of engineering they intend to enter and then transfer to the engineering school to pursue a degree, but do not earn a degree from Texas State.

Because of the many choices of curricula in the field of engineering, all pre-engineering students, from the time they first enroll, should regularly consult with their advisor in selecting courses. Failure to do so may result in loss of transfer credit. Even courses accepted for transfer credit by another university may not apply toward a degree in engineering. Only those courses acceptable by the dean of the student's elected engineering school may be counted toward the corresponding degree.

Concerning transfer of courses, Texas State has entered into transfer articulation agreements with The University of Texas at Austin, Texas A&M, Texas Tech University, and the University of Texas at San Antonio. These agreements specify suggested equivalences of courses. For additional information, contact your academic advisor.
For more information contact the College of Science Advising Center or the departmental advisor for the Department of Physics. For information on engineering technology, electrical engineering, industrial engineering, and manufacturing engineering see the Ingram School of Engineering and Department of Engineering Technology sections of this catalog.

Teacher Certification

Students interested in seeking a Physical Science (Texas Grades 8-12) certification should contact the Science Advisor for requirements. Initial or additional certification may also be acquired as a post-baccalaureate or graduate student. Students interested in certification are strongly encouraged to see the Science Advisor early in their undergraduate program or certification process.

Bachelor of Arts
Major in Physics
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. The major requires 31-34 hours.
4. 9-12 additional hours of advanced physics courses selected from PHYS 3315 (spring), 3414 (fall), 3416 (spring), 3417 (fall), 4310 (fall), 4311 (fall), 4312 (spring), 4315 (spring), 4317 (fall), 4320 (see dept.), 4321 (see dept.), or 4340 (spring).
5. Majors should consult the department advisor or the College of Science Advising Center before choosing a minor and the electives.
6. BIO 1430 and 1431 may be taken instead of CHEM 1141, 1341 and 1142, 1342 listed below.
7. ENG 3303 Technical Writing course can be substituted for the second English literature course from the general education core curriculum.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
MATH 2471	4	PHYS 1430	4	PHYS 2425	4	PHYS 2435	4
US 1100	1	MATH 2472	4	CHEM 1141, 1341 (see gen. req. 6)	4	CHEM 1142, 1342 (see gen. req. 6)	4
ENG 1310	3	ENG 1320	3	Modern Language 1410	4	Modern Language 1420	4
POSI 2310	3	HIST 1310	3	Social Science Component (see gen. req. 2)	3	PHIL 1305	3
COMM 1310	3	PFW one course	1				
PFW one course	1						
Total	15	Total	15	Total	15	Total	15

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
PHYS 3312	3	PHYS 3320	3	PHYS Electives (see gen. req. 4)	3-4	PHYS Electives (see gen. req. 4)	6-8
MATH 3373	3	PHYS 3411	4	Minor/Electives (see gen. req. 1,5 & 7)		Minor/Electives (see gen. req. 1 & 5)	5-8
Modern Language 2310	3	MATH 3323	3	ART, DAN, MU, or TH 2313	6		
HIST 1320	3	Modern Language 2320	3	Second ENG Literature (see gen. req. 2	3		
ENG Literature (see gen. req. 2)	3	POSI 2320	3	& 7)			
					3		
				Total			
Total	15	Total	16		15-16	Total	13-14

Bachelor of Science
Major in Physics
Minimum required: 120 semester hours

General Requirements:

1. A minimum of 9 writing intensive hours and a total of 36 advanced hours are required to graduate. An advanced course is one that is numbered above 3000 and below 5000.
2. See the University College section of this catalog for general education core curriculum requirements.
3. If two years of the same foreign language were taken in high school, then no additional language hours required for the degree. In the absence of such high school language, two semesters of the same modern language must be taken at the college level.
4. The major requires at least 44-46 semester hours.
5. At least 9-11 advanced PHYS chosen from: PHYS 3315 (spring), 3416 (spring), 3417 (fall), 4311 (fall), 4317 (fall), 4320 (see dept.), 4321 (see dept.), or 4340 (spring) or courses approved by the department advisor.
6. Recommended minor is mathematics. Minors and electives should be chosen in consultation with the academic advisor.
7. BIO 1430 and 1431 may be taken instead of CHEM 1141, 1341, and 1142, 1342 listed below.

Freshman Year - 1st Semester		Freshman Year - 2nd Semester		Sophomore Year - 1st Semester		Sophomore Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
MATH 2471	4	PHYS 1430	4	PHYS 2425	4	PHYS 2435	4
US 1100	1	MATH 2472	4	MATH 3323	3	MATH 3373	3
ENG 1310	3	ENG 1320	3	CHEM 1141, 1341 (see gen. req. 7)	4	CHEM 1142, 1342 (see gen. req. 7)	4
POSI 2310	3	HIST 1310	3	PHIL 1305	3	ENG Literature (see gen. req. 2)	3
COMM 1310	3	PFW one course	1			Minor (see gen. req. 6)	3
PFW one course	1						
Total	15	Total	15	Total	14	Total	17

Junior Year - 1st Semester		Junior Year - 2nd Semester		Senior Year - 1st Semester		Senior Year - 2nd Semester	
Course	Hr	Course	Hr	Course	Hr	Course	Hr
PHYS 3312	3	PHYS 3320	3	PHYS 4310	3	PHYS 4312	3
PHYS 3414	4	PHYS 3411	4	PHYS electives (see gen. req. 5)	6-8	PHYS 4315	3
Social Science Component (see gen. req. 2)	3	Electives/Minor (see gen. req. 1,3 & 6)	6	Electives/Minor (see gen. req. 1,3 & 6)	4	PHYS electives (see gen. req. 5)	3
HIST 1320	3	POSI 2320	3			Electives/Minor (see gen. req. 1,3 & 6)	3-5
ART, DAN, MU, or TH 2313	3						
Total	16	Total	16	Total	13-15	Total	12-14

Minor in Physics

A minor in Physics requires PHYS 1430, 2425, 2435, and 3312, and at least six hours of advanced physics.

Courses in Physics (PHYS)

1110 (PHYS 1105) Elementary Physics Laboratory. (0-2) This course explores and illustrates some of the basic principles covered in PHYS 1310 and 1320. This lab should be taken as you take the second of the two courses, PHYS 1310 and 1320.

1140 (PHYS 1111) Introductory Laboratory in Astronomy. (0-2) An introduction to the constellations, the uses of telescopes, and other material relating to the study of stars and planets. This course is designed to be taken with PHYS 1340 or 1350 for those students desiring a laboratory course.

1310 (PHYS 1305) Elementary Physics. (3-0) A non-mathematical survey of mechanics, properties of matter, heat and sound. These topics are described in a conceptual way with applications relating to the world around us. The laboratory experience may be obtained in a separate one-hour credit lab (PHYS 1110). PHYS 1310 and 1320 are designed for the liberal arts student. The order in which they are taken is not important. They are not recommended for pre-engineering students or majors and minors in science. The laboratory experience is recommended with the second course.

1320 (PHYS 1307) Elementary Physics. (3-0) A non-mathematical survey of electricity, magnetism, light, relativity, and atomic and nuclear physics. These topics are described in a conceptual way with applications relating to the world around us. The laboratory experience may be obtained in a separate one-hour credit lab (PHYS 1110). PHYS 1310 and 1320 are designed for the liberal arts student. The order in which they are taken is not important. They are not recommended for pre-engineering students or majors and minors in science. The laboratory experience is recommended with the second course.

1340 (PHYS 1312) Astronomy: Solar System. (3-0) A study of the solar system. Topics included are a study of the sun, the planets and their satellites, the comets, and other components of the solar system. Some aspects of telescopes and ancient astronomy will be included also.

1350 (PHYS 1311) Astronomy: Stars and Galaxies. (3-0) A study of the universe beyond the solar system. Topics included are a study of the stars and star clusters, nebulae, galaxies, and an introduction to some aspects of cosmology.

1410 (PHYS 1401) General Physics I. (3-2) This course is the first of a two semester sequence which is a survey of the basic laws and principles of physics and includes the topics of mechanics and heat. Emphasis is on solutions to physics problems; a knowledge of algebra and basic trigonometry is essential. PHYS 1410 and 1420 are designed for those students whose program requires technical physics, but who are not pre-engineering students or majors or minors in physics. Prerequisite: MATH 1315 with a grade of "C" or higher. MATH 1317 is recommended.

1420 (PHYS 1402) General Physics II. (3-2) This is the second course in a two semester sequence which is a survey of the basic laws and principles of physics and includes the topics of waves, electricity and magnetism, and light. PHYS 1410 and 1420 are designed for those students whose program requires technical physics, but who are not pre-engineering students or majors or minors in physics. Prerequisites: PHYS 1410; MATH 1315 with a grade of "C" or higher. MATH 1317 is recommended.

1430 (PHYS 2425) Mechanics. (3-3) This course covers the principles of classical mechanics through problem solving and laboratory investigations. PHYS 1430, 2425, and 2435 are designed for students majoring in physics and for pre-engineering students. Credit for both PHYS 1410 and 1430 cannot be given. Co-requisite: MATH 2471. (MC)

2425 (PHYS 2426) Electricity and Magnetism. (3-3) A study of the field of electricity and magnetism for physics majors and minors. PHYS 1430, 2425, and 2435 are designed for those students majoring or minoring in physics and for pre-engineering students. Credit in both PHYS 1420 and 2425 cannot be given. Prerequisite: PHYS 1430. Co-requisite MATH 2472.

2435 (PHYS 2427) Waves and Heat. (3-3) A study of the fields of wave motion, sound, light and heat at a beginning level for physics majors and minors. Prerequisites: MATH 2472 and PHYS 2425.

3301 Musical Acoustics. (3-0) A survey of the physics of sound and acoustic measurement. Special emphasis will be placed on sound production, propagation, and perception as applied to music. Prerequisites: PHYS 1410 and 1420 or equivalent.

3312 Modern Physics. (3-0) An introduction to the foundations of modern physics, including the following topics: relativistic mechanics, kinetic theory of matter, quantization of charge, light and energy, the atom, wave nature of particles, and the Schroedinger equation. Prerequisite: PHYS 2435.

3315 Thermodynamics. (3-0) The fundamental study of thermodynamics and statistical mechanics. Prerequisites: PHYS 2435 or 1420; MATH 3323.

3320 Introduction to Mathematical Physics. (3-0) An introduction to the mathematical methods of theoretical physics with emphasis on the vectorial-functional approach emphasized in current research literature. Applications will be made to certain fundamental problems of mechanics and electromagnetic field theory. Prerequisite: MATH 3373. Co-requisite: MATH 3323.

3411 Advanced Physics Laboratory. (2-6) Experiments in modern physics, with emphasis on demonstrating quantum effects and introducing nuclear physics. Prerequisite: PHYS 3312. (WI)

3414 Mechanics. (4-0) Fundamentals of classical mechanics focusing on the physical description of the behavior of single and multiple particle systems. Topics include advanced problem-solving strategies for systems with position and velocity-based forces, simple harmonic oscillators, non-inertial reference systems, gravitation and central forces, and rigid body motion. Prerequisite: PHYS 2435.

3416 Applied Electronics. (3-4) Laboratory/lecture course introducing electronic test bench methods for the construction, operation and analysis of important DC/AC circuits utilizing resistors, capacitors, diodes, BJTs, FETs, OpAmps, and analog/digital ICs. The behavior of the circuits will be modeled in SPICE. Elementary semiconductor device physics and microfabrication methods will be discussed. Prerequisite: PHYS 2435. (WI)

3417 Optics. (3-3) A one-semester survey of geometrical and physical optics accompanied by laboratory experience. Topics covered include electromagnetic waves and their propagation, geometrical optics, polarization, interference, diffraction, Fourier optics, and holography. Prerequisite: PHYS 2435. (WI)

4310 Electromagnetic Field Theory I. (3-0) An introduction to the electromagnetic field theory of classical physics for static fields. Topics included will be the electrostatic field, polarization and dielectrics, electrostatic energy, magnetic field of steady currents, magneto static energy, and magnetic properties of matter. Prerequisites: MATH 3323 and 3373; PHYS 3320 (or equivalent preparation with instructor approval).

4311 Condensed Matter Physics. (3-0) Application of physics principles to solid materials. Topics include crystal structure and the reciprocal lattice, including x-ray diffraction, crystal binding and elastic properties, lattice vibrations, energy bands, semiconductors and metals. Prerequisite: PHYS 3312.

4312 Quantum Mechanics, Part I. (3-0) An introductory course on quantum mechanics. Topics include concepts and formulation of quantum mechanics. Hamiltonian operator and Schroedinger equation, harmonic oscillator, matrix formulation of quantum mechanics, uncertainty principle, potential barrier problems, and the hydrogen atom. Prerequisites: MATH 3323; PHYS 3312, 3320, and six additional hours of advanced physics.

4315 Electromagnetic Field Theory II. (3-0) An introduction to the electromagnetic field theory of classical physics for time varying fields. Topics included will be electromagnetic induction, time varying electric and magnetic fields, Maxwell's equations, electromagnetic energy, electromagnetic waves and radiation, and a brief introduction to some specialized topics. Prerequisite: PHYS 4310.

4317 Computational Physics. (3-3) Introduction to computational techniques for problem-solving and research beyond the standard techniques of most physics courses. Numerical, symbolic, and simulation methods applied to modern physics using advanced mathematical software and a high-level programming language. Prerequisites: PHYS 3320 and six additional hours of advanced physics or instructor approval.

4320 Selected Study in Physics. (3-0) Topics are chosen in theoretical and experimental areas of current interest in physics with specific topic to be discussed agreed upon prior to registration. May be repeated once with different emphasis and professor for additional credit. Prerequisite: Instructor approval.

4321 Undergraduate Research. (0-9) A research project in physics to be carried out under the supervision of a faculty member by upper division physics majors. Student must contact a faculty member in advance to arrange topic and specific course objective. Course may be repeated only as an elective towards the BS or BA in physics. Prerequisite: Instructor approval.

4340 Materials Physics Laboratory. (0-9) A laboratory based course introducing a broad array of materials synthesis and characterization methods. The specific subjects will be coordinated with topics of current interest in the literature and will be chosen by mutual consent of the student and faculty advisor. Prerequisites: PHYS 3416, 3411, and 4311. (WI)

4370 Capstone Course. (0-6) Individual research on a topic selected by the student and department chair resulting in a formal paper and seminar. (WI)