The Lyle School of Engineering offers curricula leading to the Bachelor's degree in the following programs (the department responsible for each program is indicated in parentheses):

Civil Engineering (ENCE)
Computer Engineering (CSE)
Computer Science (CSE)
Electrical Engineering (EE)
Environmental Engineering (ENCE)
Environmental Science (ENCE)
Management Science (EMIS)
Mechanical Engineering (ME)

Each curriculum is under the jurisdiction of the faculty of the department in which the program is offered.

The Lyle School of Engineering also offers graduate programs toward the degrees of Master of Science, Doctor of Engineering and Doctor of Philosophy.

The departments are the Lyle School of Engineering's basic operating and budgetary units. Each department is responsible for the development and operation of its laboratories at all levels of activity and for all purposes; for the contentf-106 (v) (i) 9 (t)

- Complete the "Undergraduate Engineering Internship Program Agreement" form.
- Obtain the following approvals: faculty adviser, department chair, Director of Undergraduate Professional Experience Programs, International Student Office (for all international students).

Once the necessary approvals are obtained, the student must register for the Undergraduate Internship Program course that is designated by the student's department (CSE 5050, EE 5050, EMIS 5050, ENCE 5050, ME 5050).

Upon conclusion of the work assignment, the student must submit a report outlining the activities and duties of the internship within two weeks of the end of the term or at the end of the internship, whichever comes first. The student will submit a copy of the report to the faculty adviser, the International Office (if applicable), and the Director of Undergraduate Professional Experience Programs of the Lyle School of Engineering. The Director of Undergraduate Professional Experience Programs, in consultation with the student's adviser, will assess the report and recommend a grade of satisfactory "S" or unsatisfactory "U" to the Associate Dean for Academic Affairs within two weeks of receiving the report. The student's work experience will be validated and recognized on the permanent transcript.

COOPERATIVE EDUCATION

The history of the Lyle School of Engineering at SMU demonstrates a commitment to the concept of cooperative education. When the Lyle School of Engineering was established in 1925, it already had a close relationship with the Technical Club of Dallas. Members of this group owned factories and engineering consulting firms and wanted to participate in the training and development of their incoming employees. The Technical Club asked SMU to include the Cooperative Education Program (Co-op) in the original design of the school.

SMU was one of the first universities in the Southwest to adopt this concept of practical education. From 1925 to 1965, all Lyle School of Engineering undergraduate students participated in Co-op. Since 1965, the program has been optional.

The SMU Co-op Program is designed so that each student can enhance his or her education and career by receiving professional training while alternating terms of classroom instruction. Participation in the Co-op Program allows students to:

- Confirm that they like working in their major.
- Discover the kind of work they like within their major.
- Establish a professional reputation.
- Earn the cumulative equivalent of one year of a new graduate's starting salary before graduation.
- Gain invaluable work experience when competing for full-time jobs upon graduation.

HOW THE COOPERATIVE PROGRAM OPERATES

Entry into the Co-op Program is typically offered at the spring term of the sophomore year or the fall term of the junior year during the student's academic progression. These are shown below:

PLAN A	5 Work Terms		
	Fall	*Spring*	*Summer*
First Year			

PLAN B	4 Work Terms		
	Fall	*Spring*	*Summer*

When to Apply

mechanical engineering program, a 2.0 or higher G.P.A. is required in the following five courses: ENGL 1301, ENGL 1302 or equivalent, MATH 1337, MATH 1338 and PHYS 1303. For admission into either the computer science or management science program, a 2.0 or higher G.P.A. is required in the following six courses: ENGL 1301, ENGL 1302 or equivalent, MATH 1337, MATH 1338, CSE 1340 and CSE 1341. If a course is repeated, both grades will be used in computing the G.P.A.

Admission by Transfer from Another Institution

An undergraduate at a junior college, college or university may apply for admission to the Lyle School of Engineering. Admission will be granted provided the prior academic records and reasons for transfer are acceptable to the Lyle School of Engineering. Transfer credit will be awarded in courses that have identifiable counterparts in curricula of the Lyle School of Engineering, provided they carry grades of C- or better. Transfer students will be expected to meet requirements equivalent to students admitted from Dedman College and other schools within SMU.

Transfer credit is awarded only for work completed at institutions that have regional or comparable accreditation. Because of SMU's 60-term-hour residency requirement for a Bachelor's degree, there is a limit on the total amount of credit that may be applied toward a Lyle School of Engineering degree.

Programs of Study

The Lyle School of Engineering offers the following degrees:

Bachelor of Science in Civil Engineering
Bachelor of Science in Computer Engineering
Bachelor of Science in Electrical Engineering
Bachelor of Science in Environmental Engineering
Bachelor of Science in Mechanical Engineering
Bachelor of Science (Computer Science)
Bachelor of Science (Environmental Science)
Bachelor of Science (Management Science)
Bachelor of Arts (Computer Science)

Engineering work can be classified by function, regardless of the branch it is in, as follows: research, development, design, production, testing, planning, sales, service, construction, operation, teaching, consulting and management. The function fulfilled by an engineer results in large measure from personal characteristics and motivations, and only partially from his or her curriculum of study. Nonetheless, although engineering curricula may be relatively uniform, their modes of presentation tend to point a student toward a particular large class of functions. Engineering curricula at SMU aim generally at engineering functions that include research, development, design, management and teaching – functions ordinarily

d) An ability to function on multi-disciplinary teams using current computer engineering tools and technologies
e) An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics
f) An understanding of personal, professional and ethical responsibility
g) An ability to communicate effectively both in an oral and written form
h) The broad liberal arts education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context
i) Recognition of the need for, and an ability to engage in life-long learning
j) Knowledge of contemporary issues in computer engineering
k) An ability to use the techniques, skills and modern engineering tools neces-

Computer Facilities

Students in the Department of Computer Science and Engineering have access to a wide range of facilities and equipment. The department's computing environment has evolved into an Ethernet-based network of personal computers and servers. General-use Unix servers that run OSF1 and Linux are available. A wireless network is also available throughout the CSE facilities. Windows-based PC labs are used during the first two years of coursework. Access to the network is also available via open-area labs containing PCs.

Curriculum in Computer Science

Computers play an ever-increasing role in our society. Their use permeates all other academic disciplines and industrial arenas. Computer science is the study of the concepts and theory surrounding computer design and software construction. The SMU undergraduate program in computer science is designens d 11 nvs s-26 (t) -28 (u) -4 (d) -

Bachelor of Science with a Major in Computer Science Bioinformatics Track

Curriculum Requirements:

Area	*Required Courses*	*Term Credit Hours*
Liberal Studies:	ENGL 1301, 1302	6
	Perspectives	9-12
	Cultural Formations	3-6
Mathematics:	MATH 1337, 1338, 3353	9
	CSE 2353	3
	CSE 3365, 4340*	6
	(* Students may fulfill the 4340 requirement by taking any one of CSE/STAT/EMIS 4340, EMIS 5370, or STAT 5340)	
Science:	PHYS 1105, 1106, 1303, 1304	8
	BIOL 1401, 3304	7
	CHEM 1303/1113	4
Computer Science:	CSE 1341, 1342, 2240, 2341, 3381, 3342, 3345, 3353, 3330, 4344, 4345, 4346, 4381, 5343,	41
Bioinformatics track:	CSE 5335, CSE 5331, BIOL 5305	12
	Any one additional three-hour CSE course numbered 5000 or above as approved by adviser.	
Engineering Leadership:	CSE 4360, EMIS 3308, ENCE 3302	9
Wellness:		2
		122

Bachelor of Science with a Major in Computer Science with Premedical Specialization

Curriculum Requirements:

Area	*Required Courses*	*Term Credit Hours*
Liberal Studies:	ENGL 1301, 1302	6
	Perspectives	9-12
	Cultural Formations	3-6
	(One Perspectives course or one Cultural Formations course must satisfy the Human Diversity requirement.)	
Mathematics:	MATH 1337, 1338, 3353	9
	CSE 2353	3
	CSE 3365, 4340*	6
	(* Students may fulfill the 4340 requirement by taking any one of CSE/STAT/EMIS 4340, EMIS 5370, or STAT 5340)	
Science:	PHYS 1105, 1106, 1303, 1304	8
	BIOL 1401, 1402, 3304, 3350	14
	CHEM 1303, 1304; 1113; 1114; 3117; 3118; 3371, 3372	16
Computer Science:	CSE 1341, 1342, 2240, 2341, 3381, 3342, 3345, 3353, 3330, 4344, 4345, 4346, 4381, 5343	41
	Three TCH to be chosen from the following:	3

Bachelor of Arts with a Major in Computer Science

Curriculum Requirements:

Area	*Required Courses*	*Term Credit Hours*
Liberal Studies:	ENGL 1301, 1302	6
	Perspectives	15
	Cultural Formations	6
	(One Perspectives course or one Cultural Formations course must satisfy the Human Diversity requirement.)	
Mathematics:	MATH 1337, 1338	6
	CSE 2353	3
	STAT 2331	3

Bachelor of Science with a Major in Computer Engineering

Curriculum Requirements:

Area	*Required Courses*	*Term Credit Hours*
Liberal Studies:	ENGL 1301, 1302	6
	Perspectives	9-12
	Cultural Formations	3-6
	(One Perspectives course or one Cultural Formations course must satisfy the Human Diversity requirement.)	
Mathematics:	MATH 1337, 1338, 2343, 3353	12
	CSE 2353, 3365, 4340*	9
	(* Students may fulfill the 4340 requirement by taking any one of CSE/STAT/EMIS 4340, EMIS 5370, or STAT 5340)	
Science:	PHYS 1106, 1303, 1304	7
	CHEM 1303	3
	Three TCH from: CHEM 1304; BIOL 1401, 1402, GEOL 1301, PHYS 3305	3

1331. Introduction to Web Programming.

programming concepts including the Java API, applications, applets, interfaces, graphics, basic and advanced GUI components, HTML and multithreading. *Prerequisites:* A grade of C- or better in CSE 2341 or equivalent.

3353. Fundamentals of Algorithms. Introduction to algorithm analysis, big-Oh notation and algorithm classification by efficiency. Basic algorithm design strategies and approaches to problem solving. Sorting and searching algorithms. Introduction to graph theory and graph algorithms.

data communication, data link protocols, internetworking, routing, congestion control, industrial standards and interfaces, and the importance of lifelong learning. The group project will provide the major design experience for students in the Networks track of the Computer Engineering program. *Prerequisites:* A grade of C- or better in CSE 4344.

4360. Technical Entrepreneurship. Demonstrates the concepts involved in the management and evolution of rapidly growing technical endeavors. Students are expected to participate in active learning by doing, making mistakes and developing solutions, and observing mistakes and approaches made by the other teams. *Prerequisites:* Junior or senior standing or graduate student.

4381. Digital Computer Design. Machine organization, instruction set architecture design,

execution and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical analysis, syntax analysis, code generation, error diagnostics and simple code optimization techniques. Use of a recursive high-level language to implement a complete compiler. *Prerequisites:* A grade of C- or better in both CSE 3342 and CSE 3353.

5342. Concepts of Language Theory and Their Applications. Formal languages and their relation to automata. Introduction to finite state automata, context-free languages and Turing machines. Theoretical capabilities of each model, and applications in terms of grammars, parsing, and operational semantics. Decidable and undecidable problems about computation. *Prerequisite:* A grade of C- or better in CSE 3342 or permission of instructor.

5343. Operating Systems and System Software. Theoretical and practical aspects of

memory structure and interfacing, bus systems, support chips, tools for hardware design, analysis, simulation, implementation and debugging. The theoretical part of the course is complemented by a laboratory in which students get practical experience in designing and analyzing interfaces to processors, memories and peripherals. *Prerequisites:* A grade of C- or better in CSE 3381 or a grade of C- or better in EE 3381.

5387 (EE 5387). Digital Systems Design. Modern topics in digital systems design including the use of HDLs for circuit specification and automated synthesis tools for realization. Programmable logic devices are emphasized and used throughout the course. This course has heavy laboratory assignment content and a design project. *Prerequisite:* C- or better in CSE 3381 or EE 2381.

5(1-4)9(0-4). Special Topics. Individual or group study of selected topics in computer science. Variable credit from one to four term hours. Written permission of the supervising faculty member is required before registration.

ELECTRICAL EN

- Offering world-class Ph.D. programs that prepare graduates for academic careers, for research careers in the high technology industry or for technical entrepreneurship
- Promoting lifelong learning animated by a passion for the never-ending advance of technology

The educational objectives of the electrical engineering department undergraduate program are to enable graduates to:

- Be successful in understanding, formulating, analyzing and solving a variety of electrical engineering problems
- Be successful in designing a variety of engineering systems, products or experiments
- Be successful in careers and/or graduate study in engineering or other areas such as business, medicine and law
- Have the ability to assume leadership and entrepreneurial positions
- Successfully function and effectively communicate, both individually and in multidisciplinary teams
- Understand the importance of lifelong learning, ethics and professional accountability

The Electrical Engineering undergraduate program outcomes as related to the

antennas. Small and less complex antennas are made with a T-Tech milling machine and a photolithic/chemical etching method is used to make more complex and large antennas. Fabricated antennas are characterized with an HP 5810B network analyzer. Workstations are available for antenna design and theoretical computation. Radiation characteristics are measured at the UTD (University of Texas at Dallas) – SMU Antenna Characterization Lab near the UTD campus.

Biomedical Engineering Laboratory. This laboratory contains instrumentation for carrying out research in electrophysiology, psychophysics and medical ultrasound. Four Grass physiographs permit the measurement of electroencephalograms as well as visual and auditory evoked brain potentials. The lab also contains a state-of-the-art dual Purkinje eye tracker and image stabilizer made by Fourward

range connectivity at medium data rates, b) 802.11-based WLAN offering high data rates in an office environment, and c) Bluetooth networks that offers low cost, short range and low data rate connections. One of the research focus areas is on investigating total power efficiency of these heterogeneous networks.

Semiconductor Processing Clean Room. The 2,800 square-foot, class 10,000 clean room, consisting of a 2,400 square-foot, class 10,000 room and a class 1,000 lithography area of 400 square feet, is located in the Jerry R. Junkins Engineering Building. A partial list of equipment in this laboratory includes acid and solvent hoods, photoresist spinners, a scanning electron microscope, two contact mask aligners, a thermal evaporator, a plasma asher, a plasma etcher, a turbo-pumped methane hydrogen reactive ion etcher, a four-target sputtering system, a plasma-enhanced chemical vapor deposition reactor, a diffusion-pumped four pocket e-beam evaporator, an ellipsometer, and a profilometer. Other equipment includes a boron-trichloride reactive ion etcher, a chemical-assisted ion-beam etcher, and an e-beam evaporator for dielectric deposition. The clean room is capable of processing silicon and compound semiconductors for microelectronic, photonic, nanotechnology devices.

Submicron Grating Laboratory. This laboratory is dedicated to holographic grating fabrication and has the capability of sub tenth-micron lines and spaces. Equipment includes a floating air table, an argon ion laser (ultraviolet lines) and an Atomic Force Microscope. This laboratory is used to make photonic devices with

to evaluate the electrical and optical characteristics of smart pixel devices and FSOI modules. Support electronics hardware includes various test instrumentation, such as arbitrary waveform generators and a variety of CAD tools for optical and electronic design including optical ray trace and finite difference time domain software.

CURRICULUM IN ELECTRICAL ENGINEERING

Three hours of advanced electrical engineering electives must be selected in each of the three areas listed below:

EE 5360, 5362, 5370, 5371, 5372, 5373, 5374, 5375; and 5376
EE 5356, 5357, 5381, 5385 and 5387;
EE 5310, 5312, 5314, 5321, 5330, 5332 and 5333.

The remaining six hours of advanced electrical engineering electives may be chosen from any of the above three areas or advanced (5000-level) CSE courses offered by the CSE Department with the approval of the student's adviser. Please note that EE 8000-level courses are primarily for graduate students but may be taken by highly qualified undergraduates with the approval of the adviser and the instructor. Special topics courses also are available.

Each student is expected to complete and file a plan of study with his or her academic adviser. The plan should state specific choices to meet the foregoing requirements and develop an area of specialization when this is desired. This should

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2381. Digital Computer Logic. Digital computers and information; combinational logic circuits; combinational logic design; sequential circuits including finite-state machines; registers and counters; memory and programmed logic design. Design and simulation of digital computer logic circuits are studied. Concurrent registration in EE 2181.

3(1-3)90. Junior Project.

3122. EE Laboratory: Electronic Circuits II. Experiments in analog electronic circuit design. *Prerequisite:* EE 2122 (Grade of C- or better) and EE 2322 (Grade of C- or better). Concurrent registration in EE 3322.

3181. EE Laboratory: Microprocessors. Fundamentals of microprocessor design and assembly-language programming. An introduction to the HCS12 Freescale processors, Codewarrior Assembler, microprocessor-based system design, assembly programming, and hardware interfacing. *Prerequisite:* EE 2181 (Grade of C- or better) and EE 2381 (Grade of C- or better). Concurrent registration in EE 3381.

3311. Solid-State Devices. This laboratory-oriented elective course introduces undergraduates to the working principles of semiconductor devices by fabricating and testing silicon MOSFET transistors and III-V based semiconductor lasers in the SMU clean room. Lectures

discrete-time systems, controllability, observability, and minimal representations; linear-state variable feedback, observers, and quadratic regulator theory. *Prerequisite:* EE 3372.

Second year:

Fall	*Spring*
EMIS 2360	ACCT 2301
CSE 1342	Science/Tech (Group 3)
Science/Tech (Group 2)	Math 3315
Perspective	Perspective
MATH 3353	Cultural Formations

Third year:

Fall	*Spring*
EMIS 3360	EMIS 3309
EMIS 3308	ENCE 3302
STAT 4340	Cultural Formations
Perspective	Perspective
Science (Group 3)	Elective

Fourth year:

Computing Facilities

Students in the EMIS Department have access to a wide range of computing facilities and networking equipment. The department manages three PC-based computing labs, including the Enterprise Systems Design Laboratory created for students in the senior design course. General-use Unix and Linux machines (includ-

4340 (STAT 4340). Statistical Methods for Engineers and Applied Scientists. Basic concepts of probability and statistics useful in the solution of engineering and applied science problems. Topics: probability, probability distributions, data analysis, sampling distributions, estimations

5369. Reliability Engineering. An introduction to reliability engineering concepts, principles, techniques and methods required for design and development of affordable products and services that meet customer expectations. Topics include reliability concepts and definitions, figures-of-merit, mathematical models, design analysis and trade studies, reliability testing including types of tests, test planning and analysis of test results, and statistical analysis of reliability data. 1 TCH Design. *Prerequisite:* C- or better in EMIS 4340 or 5370.

5370 (STAT 5340). Probability and Statistics for Scientists and Engineers. An introduction to fundamentals of probability and distribution theory, statistical techniques used by engineers and physical scientists. Examples of tests of significance, operating characteristic curves, tests of hypothesis for one or two parameters, estimation, analysis of variance, and the choice of a particular experimental pr1 (i5(n)p) -1-35 5 (0) -1 -2g9 (e) -5p5 (,9 (u) -24 (l)10 (t) -) 5 (a) -25 (

and were determined based on the needs of the program's various constituencies. The program prepares graduates to achieve the following educational objectives during the medium term of their professional careers:

1. Assume important leadership positions in a globally competitive world.
2. Fully participate either as engineering designers or managers in the public or private sectors.
3. Pursue advanced academic or professional degrees in engineering, medicine, law, business, or public policy.
4. Licensing as professional engineers.

Degrees Offered

The Environmental and Civil Engineering Department offers undergraduate degrees as follows:

Bachelor of Science in Environmental Engineering
Bachelor of Science in Environmental Engineering and Bachelor of Science in Mathematics dual degrees
Bachelor of Science in Environmental Engineering with a Premedical Specialization
Bachelor of Science in Environmental Science
Bachelor of Science in Environmental Science with a Premedical Specialization
Bachelor of Science in Civil Engineering
Bachelor of Science in Civil Engineering and Bachelor of Science in Mathematics dual degrees

The undergraduate programs in environmental engineering and civil engineering are accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone (410) 347-7700. ABET does not provide accreditation for the discipline of environmental science.

Both the environmental and civil engineering programs are designed to prepare students for the Fundamentals of Engineering (FE) Examination, the first step toward licensure as a Professional Engineer (P.E.). Engineering design is integrated throughout the environmental and civil engineering curricula, each culminating in a major design experience based on the knowledge and skills acquired in earlier course work. In their senior year, the department's engineering students are required to take two terms of design where teams of two to four students work closely on practical projects sponsored by industry and government. Senior design projects incorporate engineering standards and realistic constraints including most of the following considerations:

Departmental Facilities

Departmental offices and instructional and research laboratories are located in the new, state-of-the-art J. Lindsay Embrey Engineering Building. Environmental teaching and research laboratories include dedicated space for air quality and meteorology, industrial hygiene, environmental microbiology and water quality. The air quality/meteorology and water quality laboratories are capable of conducting sophisticated chemical analyses of air samples, and assessing the quality of water supplies and wastes and the effectiveness of water and waste treatment procedures. Major equipment includes several spectrophotometers including atomic absorption (AA), inductively coupled plasma (ICP) emission for low-level heavy metals analysis, and two Hewlett-Packard gas chromatographs (GC). Other equipment includes continuous ambient air monitoring equipment, a UV/visible spectrophotometer, pH and other specific ion meters, incubating ovens, microscopes, furnaces, centrifuges, dissolved oxygen meters, a Mettler titrator for chemical and acid/base surface experiments, several temperature control baths, and a tumbler for constant temperature studies. The air quality and meteorology laboratory includes state-of-the-art airflow, pressure, and volume measurement instrumentation. The industrial hygiene laboratory includes an inventory of the latest state-of-the-art personal monitoring equipment for assessing occupational exposure to a variety of industrial process stressors including: asbestos, noise, total and respirable dust, metals, radiation, and heat stress.

Civil engineering teaching and research laboratories include dedicated space for mechanics of materials and structural engineering, hydraulics and hydrology, soil mechanics and geotechnical engineering, transportation materials, and intelligent

	Earth Science: ENCE 1331 Meteorology Physics: PHYS 1105, 1106, 1303, 1304	23
Engineering Science and Design:	Computer Science and Engineering: CSE 1340 or 1341 Civil/Mechanical Engineering: ENCE 2310, 2331, 2342	12
Environmental Engineering and Design:	ENCE 1302, 2304, 2421, 3323, 3341, 3431, 3451, 4380, 4381, 5317, 5354, 5372	39
Advanced Environmental/ Mathematics Electives:	*Choose two from:* ENCE 5331, 5332, 5334; ME 5336	6
Minimum total hours required		**130**

Bachelor of Science in Environmental Science

Curriculum Requirements		*Term Credit Hours*
College Requirements:	Humanities, Social Sciences and SMU required courses	29
Mathematics and Statistics:	MATH 1337, 1338; STAT 4340 or 5340	9
Sciences:	Biology: BIOL 1401, 1402 Chemistry: CHEM 1113, 1114, 1303, 1304 Earth Science: ENCE 1331, GEOL 1301 Physics: PHYS 1105, 1106, 1303, 1304	30
Engineering Science:	Computer Science and Engineering: CSE 1340 or 1341, or EMIS 1307	3
Environmental Engineering:	Core: ENCE 1302, 2304, 2421 3302 Advanced: ENCE 3341, 3431, 3451, 5317 Management *(Choose any 4 of the following 7):* ENCE 5311, 5314, 5315, 5323, 5350, 5352, 5353	39
Environmental Technical Electives:	Selected with adviser approval	6
Technical and Engineering Leadership Electives:	Free electives	6
Minimum total hours required		**122**

Bachelor of Science in Environmental Science (Premedical Specialization)

Curriculum Requirements		*Term Credit Hours*
College Requirements:	Humanities, Social Sciences and SMU required courses	29
Mathematics and Statistics:		

Curriculum Requirements		*Term Credit Hours*
Environmental Technical Electives:	Selected with adviser approval	3
Technical or Engineering Leadership Elective:	Free elective	3
Minimum total hours required		**127**

Bachelor of Science in Civil Engineering

Curriculum Requirements		*Term Credit Hours*
College Requirements:	Humanities, Social Sciences and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343; STAT 4340 or 5340	15
Sciences:	Chemistry: CHEM 1113, 1114, 1303, 1304 Earth Science: GEOL 1301 or 1315 Physics: PHYS 1105, 1106, 1303, 1304	19
Engineering Science and Design:	Computer Science and Engineering: CSE 1340 or 1341 Civil/Mechanical Engineering: ENCE 2320, 2331, 2342/2142	13
Civil Engineering and Design:	ENCE 1302, 2304, 2310, 2340/2140, 3323, 3350, 4350, 4351, 4380, 4381, 4385, 5354, 5372, 5378	43
Civil Engineering Technical Electives:	Selected with adviser approval	6
Engineering Leadership:	ENCE 3302 and one of CSE 4360, EMIS 3308, and 3309	6
Minimum total hours required		**125**

Bachelor of Science in Civil Engineering and Bachelor of Science in Mathematics

Curriculum Requirements		*Term Credit Hours*
College Requirements:	Humanities, Social Sciences and SMU required courses	23
Mathematics and Statistics:	MATH 1337, 1338, 2339, 2343, 3315, 3337 and two advanced MATH electives selected with math adviser approval; STAT 4340 or 5340	27
Sciences:	Chemistry: CHEM 1113, 1114, 1303, 1304 Earth Science: GEOL 1301 or 1315 Physics: PHYS 1105, 1106, 1303, 1304	19
Engineering Science and Design:	Computer Science and Engineering: CSE 1340 or 1341 Civil/Mechanical Engineering: ENCE 2320, 2331, 2342/2142	13
Civil Engineering and Design:	ENCE 1302, 2304, 2310, 2340/2140, 3323, 3350, 4350, 4351, 4380, 4381, 4385, 5354, 5372, 5378	43
Advanced Civil Engineering/ Mathematics:	*Choose two from:* ENCE 5361, ENCE 5364; ME 5322	6
Minimum total hours required		**131**

Minor in Environmental Engineering

For approval of a minor in environmental engineering, the student should consult the Environmental and Civil Engineering Department. A minimum of 15 term credit hours in environmental engineering courses is required. One example of an approved set of courses that provides a broad introduction to environmental engineering is:

ENCE 2304 Introduction to Environmental Engineering and Science
ENCE 2421 Aquatic Chemistry
ENCE 3431 Fundamentals of Air Quality I
ENCE 4329 Design of Water and Wastewater Systems
ENCE 5354 Environmental Engineering Principles and Processes

Based on the student's interests and background, other sets of environmental engineering courses may be substituted with the approval of the Environmental

4329. Design of Water and Wastewater Systems. Physical, chemical and biological concepts and processes that are specific to public water supplies and municipal wastewater management are covered. Fluid mechanics is reviewed followed by an introduction to hydraulic modeling for design of water distribution networks and wastewater collection networks. Design and operation of treatment systems for both drinking water and municipal wastewater pollution control are covered. Process modeling is employed for completion of two design projects, one for a public water supply treatment plant and the other for municipal wastewater treatment plant. Field trips are conducted to a public water supply treatment plant and to a municipal wastewater treatment plant. *Prerequisites:* CHEM 1303, and ENCE 2304 and ENCE 2342.

4333. Fundamentals of Air Quality II. Fundamental and advanced topics in air quality are covered, building upon ENCE 3431. Atmospheric disp clcq 48 i lsuita1 (-2 (t1 (-3(n) -5 ( )26 (F) - -3(n) -5 ( )

5333. Laboratory Methods in Environmental Engineering. This course provides students with hands-on, state-of-the-art experience with important experimental methods in environmental systems, evaluating the reliability and significance of parameter determinations. Covers instrumental and statistical methods used for characterization of water, air and soil quality. Introduction to treatability studies including reactor dynamics. The course format provides two hours of lecture and three hours of laboratory component. *Prerequisite:* ENCE 5313 or two terms of undergraduate chemistry.

5334. Fate and Transport of Contaminants. Development and application of fate and transport models for water-borne contaminants with focus on material balance principle; mass transport and transformation processes; modeling of lakes and reservoirs; stream

modeling techniques for design of unit processes to achieve specific treatment objectives. *Prerequisites:* CHEM 1303, ENCE 2304 and ENCE 2342, and MATH 2343.

5361. Matrix Structural Analysis and Introduction to Finite Element Methods. A systematic approach to formulation of force and displacement method of analysis; representation of structures as assemblages of elements; computer solution of structural systems. *Prerequisite:* ENCE 3350.

5362. Engineering Analysis with Numerical Methods. Applications of numerical and approximate methods in solving a variety of engineering problems. Examples include equilibrium, buckling, vibration, fluid mechanics, thermal science and other engineering applications. *Prerequisite:* Permission of instructor.

5363. Architectural and Structural Engineering. The basic principles of structural analysis and mechanics of deformable bodies are introduced. Structural systems and principles are presented with an emphasis on architectural design. Students will be provided with a conceptual introduction to structures emphasizing the integration of structural and architectural

management of the facility over its entire life-cycle extending from planning and budgeting to the management of its assets and construction projects is included.

5372. Introduction to CAD. Provides students with hands-on, state-of-the-art experience with computer-aided drafting using AutoCAD to produce drawings used for engineering presentations and construction. Students will learn how to draw lines, curvilinear lines, use blocks and external references, write text, create plot files, and many other commands necessary to produce engineering drawings as used to construct environmental, civil and structural engineering projects.

5373. Prestressed Concrete. Theory and application of prestressed concrete members, time-dependent deflections and continuous prestressed beams. *Prerequisites:* ENCE 4350.

5375. Advanced Concrete Design. Behavior, analysis and design of concrete slender columns, two-way slab systems and deep beams. Yield line analysis for slabs. Design and behavior of shear walls, retaining walls and foundations systems. *Prerequisite:* ENCE 4350.

5377. Advanced Steel Design. Behavior and design of steel structures including general methods of plastic analysis, plastic moment distribution, steel frames, unbraced and braced frames, and composite construction. *Prerequisites:* ENCE 4350.

5378. Transportation Planning and Traffic Engineering. This course is concerned mainly with the analysis and modeling of urban transportation systems. The course consists of three main parts. The first part provides an overview of main definitions and terminologies involved in the planning and modeling of urban transportation systems. The second part introduces the concept of urban transportation planning systems along with an overview of various models used in travel demand forecasting. The third part describes principles of traffic operations, analysis and control. *Prerequisite:* Basic principles of probability and statistics.

5383. Heating, Ventilating and Air Conditioning. Examines the science and practice of controlling environmental conditions through the use of thermal processes and systems. Specific applications include refrigeration, psychometrics, solar radiation, heating and cooling loads in buildings, and design of duct and piping systems. Theory and analysis are emphasized. *Prerequisites:* ENCE 2331, ENCE 2342 and ME 3332.

5384. Energy Management for Buildings. Procedures to select energy saving options for buildings are examined with emphasis on the practical aspects of the subject. Space planning, architectural considerations, cost and environmental impact of the mechanical and electrical systems are considered along with optimizing the life cycle cost of the proposed alternative. Software for life cycle cost and energy analysis are used to calculate energy consumption and compare energy features of proposed, audit-determined feasible changes to a building.

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conducted by faculty and to consider extending their studies toward a graduate degree in mechanical engineering at SMU or elsewhere.

In conjunction with a solid liberal arts component, the program prepares students for graduate studies not only in engineering but also in other professional fields such as business, medicine and law. SMU mechanical engineering graduates have consistently and successfully attained higher degrees in engineering, medicine, business and law, besides gaining employment as engineers or consulting engineers for major engineering,

Bachelor of Science in Mechanical Engineering
(with a Premedical/Biomedical Specialization)
Bachelor of Science in Mechanical Engineering
(with a Manufacturing Specialization)
Bachelor of Science in Mechanical Engineering
(with an Engineering Management and Entrepreneurship Specialization)
Master of Science in Mechanical Engineering
Master of Science in Manufacturing Systems Management

polarity plasma arc welding, friction stir welding, micro plasma arc welding),

is composed of materials, works in a material environment, and is controlled by other material devices, it is clear that the materials sciences lie at the heart of the design synthesis process.

Control Systems. Provides necessary background for engineers in the dynamics of systems. In the study of controls, both the transient and steady-state behavior of the system are of interest. The transient behavior is particularly important in the starting and stopping of propulsion systems and in maneuvering flight, whereas the steady-state behavior describes the normal operating state. Some familiar examples of control systems include the flight controls of an airplane or space vehicle and the thermostat on a heating or cooling system.

Design Synthesis. The process by which practical engineering solutions are created to satisfy a need of society in an efficient, economical and practical way. This synthesis process is the culmination of the study of mechanical engineering and deals with all elements of science, mathematics and engineering.

Bachelor of Science in Mechanical Engineering
Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineer

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree with Premedical/Biomedical Specialization are as follows:

Curriculum Requirements		Term Credit Hours
General Education:	ENGL	

Bachelor of Science in Mechanical Engineering (Engineering Management and Entrepreneurship Specialization)

The Mechanical Engineering Department offers a B.S.M.E. degree with an Engineering Management and Entrepreneurship Specialization. This program includes required courses in Engineering Management, Information Engineering and Global Perspectives, Technical Entrepreneurship and Technical Communications, while at the same time satisfying the requirements for an accredited degree in mechanical engineering.

Curriculum Notes

The minimum requirements for a Bachelor of Science in Mechanical Engineering degree with a Management and Entrepreneurship specialization are as follows:

Curriculum Requirements		*Term Credit Hours*
General Education:	ENGL 1301, 1302, Perspectives and Cultural Formations Courses.	21
Mathematics and Sciences:	MATH 1337, 1338, 2339, 2343 and STAT 4340 or equivalent. PHYS 1303, 1304,1105; CHEM 1303; two additional 3000 level or higher math or science courses with the approval of the student's adviser.	31
Mechanical Engineering:	ME 1202, 1102, 1305, 2310, 2320, 2331, 2131, 2340, 2140, 2342, 2142, 3332, 3132, 3340, 3370, 4338, 4360, 4160, 4370, 4380, 4381 and 5322.	53
Specialization:	EMIS 3308, EMIS 3309, CSE 4360 and ENCE 3302	12
Advanced Major Electives:	Must be selected from 3000 level or higher ME courses with the approval of the student's adviser.	6
Wellness I and II:		2

3340. Engineering Materials. A study of the fundamental factors influencing the structure and properties of structural materials, including metals, polymers and ceramic. Phase diagrams, heat treatment, metallography, mechanical behavior, atomic bonding and corrosion are covered. *Prerequisite:* CHEM 1303 or equivalent.

3341. Intermediate Thermal Sciences. Application of the laws of thermodynamics, availability, irreversibility, real gases and mixtures, generalized thermodynamics relations and charts, and chemical equilibrium. *Prerequisite:* ME 2331.

3350. Structural Analysis. Emphasis on the classical methods of analysis of statically determinate and indeterminate structural systems. Computation of reactions, shears, moments, and deflections of beams, trusses, and frames. Use of computers as an analytical tool. *Prerequisites:* ME 2340/2140.

3360. Fluid Power Systems. Principles of operations, design criteria, and performance characteristics of fluid power systems components such as pumps, motors, valves and cylinders. Goals-oriented circuit design and analysis, industrial standards, circuit representation, and maintenance. Practical/demo lectures, a design project based on specialized software, industry speakers and site visits. *Prerequisites:* ME 2342 and ME 2320.

3370. Manufacturing Processes. This course presents a comprehensive, balanced and up-to-date coverage of the relevant fundamentals and real-world applications of manufacturing processes (casting, forming, machining, laser beam machining, electrical discharge machining, abrasive waterjet machining, etc.). Rapid prototyping and manufacturing is

4380. Mechanical Engineering Design I. A study of design methodology and development of professional project-oriented skills including communication, team management, creative problem solving, interpersonal management and leadership skills. Team-project activities are used to apply project-oriented skills to solution of design problems. Nontechnical considerations in design, including patents, ethics, aesthetics, safety and economics are investigated. *Prerequisite or corequisite:* ME 3370 or senior standing.

4381. Mechanical Engineering Design II. Student design teams have full responsibility for conducting a full-term design project for an industrial client. Periodic design reports and design reviews are presented to, and critiqued by, the industrial client, the faculty and the design team. *Prerequisite or corequisite:* ME 4370. *Prerequisite:* ME 4380 or senior standing.

5326. Vehicle Dynamics. Computer animation and simulation are used to model wheeled vehicles to predict performance, handling and ride. Topics include effects of vehicle center of mass, tire-characteristic traction and slip, engine characteristics and gear ratios of performance. Suspension design and steady-state handling models of four-wheeled vehicles and car-trailer systems are examined to determine oversteer and understeer characteristics, critical speeds and stability. Multi-degree-of-freedom ride models including tire and suspension compliance are also examined.

temperature humidity bias testing, and temperature cycle testing will be covered. Measure-

5360. Electronic Product Design and Reliability. Provides a complete description of the fundamentals of the design process for electronic products. Covers the obtaining of the voice of the customer through processes such as Quality Function Deployment. Analyzes the process of conceptual design. Carries the concept through the parametric and tolerance analysis. The design review process will be discussed as well as a review of the use of CAD tools for schematic capture and PWB layout. Reviews the use of modern tools for the maintenance of design documentation, the process of product realization through prototypes, manufacturing trials, and the introduction into high volume manufacturing. The impact of design choices on product quality and reliability will be discussed in detail as will the prediction and measurement of product lifetimes. *Prerequisites:* ME 3340.

5383. Heating, Ventilating and Air Conditioning. Focuses on selection and design of basic refrigeration, air conditioning, and heating systems. Load calculations, psychometrics, cooling coils, cooling towers, cryogenics, solar energy applications and special topics are included. *Prerequisites:*