

THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

Dean: Professor Johnson; *Assistant Deans:* Tolley, Price

The William States Lee College of Engineering has adopted a vision that:

- The College will be *the engineering college of choice* for students, faculty, sponsors and partners, reflecting the prestige gained by the excellence of our programs, research, graduates, and faculty.
- The College nurtures *collaborative and friendly learning* communities in which all stakeholders (students, faculty, sponsors, and partners) can succeed and are involved in the continuous assessment and improvement processes.
- Student development, faculty development, and resource and community development are guided by the principle that they should *enhance our learning* environment and promote the prestige of our institution.

The Lee College offers baccalaureate degree programs in Engineering and Engineering Technology. On the graduate level, the College offers programs leading to master's degrees in Engineering; the Ph.D. in electrical engineering and mechanical engineering; and, in cooperation with North Carolina State University, a program leading to the Ph.D. degree in Civil Engineering. (See the *Graduate Catalog*)

The College is composed of the Departments of Civil Engineering, Electrical and Computer Engineering, Mechanical Engineering and Engineering Science, and Engineering Technology.

The engineering programs offer professional engineering education to prepare students for careers as engineers, researchers and professional registration. The engineering technology programs are designed to provide graduates of two-year associate degree engineering technology programs an opportunity to continue their education at the baccalaureate level and to pursue careers as engineering technologists.

Engineering Programs. The baccalaureate programs in engineering offer a professional engineering education that can be used as the foundation for several different career objectives: careers as professional engineers in industry, business, or consulting; graduate study to prepare for careers in research, development, or teaching; and a more general and more liberal engineering education with the objective of keeping a variety of career avenues open.

Whatever the career objective of the student, a sound engineering educational program ensures their graduates have: (a) an ability to apply knowledge of math, science and engineering, (b) an ability to design and conduct experiments/analyze and interpret data, (c) an ability to

design a system, component, or process, (d) an ability to function on multi-disciplinary teams, (e) an ability to identify, formulate, and solve engineering problems, (f) an understanding of professional and ethical responsibility, (g) an ability to communicate effectively, (h) an ability to evaluate the impact of technology in a global/societal context, (i) an appreciation for lifelong learning, (j) knowledge of contemporary issues, and (k) an ability to use the techniques, skills, and modern tools for engineering practice. The course of study will involve the humanities, social sciences, physical sciences, mathematics, and engineering sciences. The student expecting to accept employment in industry may emphasize the engineering design and engineering science aspects of his or her program, while the student preparing for graduate study might emphasize the mathematics and science aspects. Some engineering graduates ultimately take on executive and management responsibilities in industries and firms that are based upon engineering products and engineering services. Such students may choose to construct an elective option in their program that includes business administration and economics offerings and other courses to strengthen their communication skills.

Engineering students are strongly encouraged to pursue the requirements for registration as a Professional Engineer. The first step in the registration process is the successful completion of the Fundamentals of Engineering Exam. Students are encouraged to take this exam during their senior year. Additional requirements for professional licensure subsequent to graduation include the accumulation of at least four years of progressive engineering experience and successful completion of the Professional Engineer (PE Exam). Students who complete the cooperative education program (next page) or who complete their Master's degree only need three years of progressive engineering experience to be eligible to take the PE Exam.

Engineering Technology Program. Engineering technology is the profession in which a knowledge of mathematics and natural sciences gained by higher education, experience, and practice is devoted primarily to the implementation and extension of existing technology for the benefit of humanity. Engineering technology education focuses primarily on the applied aspects of science and engineering aimed at preparing graduates for practice in that portion of the technological spectrum closest to the product improvement, manufacturing, and engineering operational functions.

Engineering technology programs are characterized by their focus on application and practice and by their approximately 50/50 mix of theory and laboratory experience.

Graduates of the engineering technology program are recruited by most major technological companies in the U.S. They are employed across the technological spectrum but are better suited to areas that deal with application,

implementation, and production as opposed to the conceptual design, analysis and research functions. The technical sales and customer services fields also account for many placements.

ACADEMIC PROGRESSION REQUIREMENTS AND DISCONTINUANCE CONDITIONS FOR:

I. Bachelor's Degree Programs and Advising in the College of Engineering

Students may be admitted to one of the four College of Engineering departments: Civil Engineering (CEGR), Electrical and Computer Engineering (EEGR and CPGR), Mechanical Engineering (MEGR), and Engineering Technology (ET). Students may also be admitted as ENGR (*engineering undecided*), or FEGR (*freshman engineering*) majors.

Engineering Undecided (ENGR) is an individualized advising program for students who qualify for admission to an engineering major but who have not decided which department they desire. ENGR students may change their classification to a specific department once they have decided upon a major. ENGR students must make such a decision no later than the completion of their freshman year.

Freshman Engineering (FEGR) is an individualized advising program for students who meet the requirements for conditional admission to a baccalaureate degree program in the College of Engineering but who are not admitted directly to one of the programs.

Students are expected to follow the advice and recommendations of their faculty advisors and are expected to know and follow all pre-requisite, co-requisite, and progression requirements of their program. Persistent attempts to circumvent that advice and guidance shall be grounds for discontinuance.

Students must demonstrate that they are making satisfactory progress toward completion of their major degree. They are in violation of this requirement and subject to discontinuance if they have two consecutive semesters of unsatisfactory progress.

II. Freshman Year Requirements

All new freshman students are initially advised by a central office within the College of Engineering. Students are eligible for transfer to their major department for further advising once they have achieved the following:

1. completion of all non-elective courses in their freshman year curriculum with grades of *C* or better, and
2. a minimum cumulative grade point average (GPA) of 2.00 for all courses taken.

III. Sophomore Through Senior Year Requirements

In addition to the University requirements for continued enrollment, students must maintain a major cumulative GPA of 2.00 for all courses in the departmental curriculum taught by the College. Failure to meet this requirement for two consecutive semesters will result in suspension from the College of Engineering.

IV. Requirements for Readmission after Discontinuation by Engineering

An undergraduate student who has been discontinued for failure to satisfy the College requirement for continuation stated above, but who nonetheless meets the conditions for continued enrollment in the University, will be ineligible for readmission to the College until:

1. an appeal is accepted through the College of Engineering, or
2. the student elects to use the Two-Year-Rule.

A student who has been suspended by the University must follow University guidelines for appeal. Readmission to the College after discontinuation or suspension is not automatic. An application for readmission must be made by the student and approved by the College/department. Students who are readmitted after discontinuation by the College, suspension by the University, or under the Two-Year Rule must meet requirements for continued enrollment appropriate to their individual situation. These requirements are specified in a "Continuation Agreement" that is mutually agreed upon and signed by the student and his/her appropriate advisor. The consequences of failure to meet the requirements of the agreement may be articulated in the agreement itself. However, if these consequences are not included in the agreement, failure to meet the requirements will automatically result in the student's discontinuation from the College.

SPECIAL COLLEGE PROGRAMS

MAPS – Maximizing Academic and Professional Success. The College's nationally recognized MAPS program assists students in developing the personal, academic, and professional skills needed for success. The program includes peer mentoring in individual or small group sessions, Supplemental Instruction (SI), tutoring, workshops and study groups. SI and/or tutoring is available for courses such as calculus, chemistry, and physics and for sophomore and junior engineering and engineering technology courses. Assessment results indicate that students who regularly participate in MAPS perform well academically and are much more likely to graduate from the College.

Freshman Learning Community (FLC).

The FLC houses a limited number of engineering students on one floor of a residence hall. During the fall semester, FLC students take classes together and the introductory engineering course and the first semester English course are taught in the residence hall. Students are assigned a peer mentor, and SI for calculus and chemistry is provided by the MAPS Program. Other special events such as chemistry study nights, ropes course, community service projects, and social activities are also available to participants.

Student Leadership Academy. The Leadership Academy is an optional extracurricular program designed to develop the leadership potential of engineering students through a series of weekend retreats with other students, faculty and industry partners. Top industry executives help facilitate specific activities providing some real-world perspective on being a successful leader in business and in the community.

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Cooperative Education (Co-op) Program. Students in The William States Lee College of Engineering may obtain practical work experience while pursuing their degree by participating in cooperative education whereby a student alternates semesters of full-time academic study with semesters of full-time work experience in industry. The work experience is under the direction of the student's major department and is closely related to his or her field of study. Civil engineering, computer engineering, electrical engineering, and mechanical engineering students who fulfill all requirements of the co-op program can earn up to three credit hours for a technical elective and will receive partial credit toward the professional practice requirement for registration as a Professional Engineer.

To be eligible for the Co-op program, an engineering student must have completed at least 24 credit hours at UNC Charlotte including a number of specified courses with a minimum GPA of 2.5. A transfer student is expected to have completed at least 12 hours at UNC Charlotte. An engineering technology student must have earned an Associate of Applied Science degree with a GPA of 2.5 or better (out of 4.0) and completed at least 12 hours at UNC Charlotte.

For an undergraduate to be officially designated as a Co-op student, he or she must participate in at least three semesters of work experience (three work sessions and three seminar courses). Consequently, participation in Co-op Education usually means that the student will take five years to complete the engineering program or three years (at UNC Charlotte) to complete the engineering technology program.

Students interested in learning more about the advantages and opportunities of participating in this program should contact the College's Faculty Associate for Student Professional Development or the University Career Center.

Domestic Internships. A number of opportunities for internships, called 49erships, exist for students in the College. Engineering internships are almost always paid positions. Students interested in learning more about these opportunities should consult with their advisor, the College's Faculty Associate for Student Professional Development or the University Career Center.

International Internships. The College's International Exchange program provides for overseas study, research, and/or an industrial experience. In many cases, students who meet eligibility requirements receive special scholarships and/or grants to help defray the cost of these programs.

CONTINUING ENGINEERING STUDIES

The William States Lee College of Engineering sponsors various special educational programs for practicing engineers, technologists, technicians, and others in addition to its regular academic degree programs and courses. These include conferences, short courses, seminars, and other continuing education programs designed to aid those practicing in the technical professions and occupations to keep abreast of the latest developments in the rapidly expanding technology. For more

information, contact the Office of Continuing Education, Extension, and Summer Programs.

Department of Civil Engineering

Chairperson: Associate Professor Young; *Professors Emeritus:* Bayer, Evett, King; *Duke Energy Distinguished Professor:* Inyang; *Professors:* Janardhanam, Wu; *Associate Professors:* Bowen, Graham, Kane; *Assistant Professors:* Anderson, Daniels, Gergely, Hilger, Ogunro, Weggel

The program in Civil Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202, Telephone: (410) 347-7700.

The objectives of the undergraduate program in Civil Engineering are to:

(a) provide students with the latest social, mathematical, scientific and engineering educational experiences required to access needs, define problems, evaluate alternatives, propose appropriate solutions and implement designs;

(b) provide students with the social science and management educational experiences required to effectively work in teams, communicate recommendations and manage the implementation of their designs; and

(c) promote concern for environmental, societal and global ramifications of engineering solutions, the value of the profession and its ethics, the opportunities provided by graduate studies, and the necessity of life-long learning.

These objectives are accomplished through a flexible curriculum and through interactions with other departments and colleges of the University and with the professional community.

A major role of civil engineers is to focus scientific and technological skills on the creation of physical facilities, the engineering and construction of which advance society toward such basic goals as economic development, environmental protection, and social well-being. Civil engineers may be involved in analysis, design, construction, and monitoring of: buildings, bridges, dams, and other structures; water resources for urban use, industry and land reclamation; systems for water transmission and river control; water quality control systems for purification and waste treatment; transportation systems including highways, mass transit, airports, railroads, pipelines, canals, and harbor facilities; solutions for environmental problems including air pollution, ground pollution, water pollution, noise pollution, ecological effects, land development, and urban and regional planning; and in subsurface foundation systems. Civil engineers must bring about a satisfactory blending of constructed facilities with the natural and social environments, creating an optimum relationship between humans and the environment while helping safeguard the health, safety, and welfare of the public.

The Department offers a Bachelor of Science in Civil Engineering (B.S.C.E.) degree, a Master of Science in Civil Engineering (M.S.C.E.) degree, and a Master of Science in

Engineering (M.S.E.) degree. Doctoral studies leading to the Doctor of Philosophy (Ph.D.) degree are available through a cooperative arrangement with North Carolina State University. For information about the master's programs, see the *UNC Charlotte Graduate Catalog*.

Students may plan early in their undergraduate careers for continuation of their engineering studies beyond the first degree. The large number of fields of graduate study that follow the curriculum offered by the Department of Civil Engineering influence how each student plans his/her undergraduate program of study. Twenty one hours of technical electives allow flexibility for study in specific areas. Each student may design a technical elective program with his or her advisor's approval in order to achieve individual goals and follow a desired track.

Additionally, students may take nine hours (three "Optional Courses") beyond the BSCE requirements from prescribed menus in each of the areas of Environmental, Geotechnical, Structural, and Transportation Engineering to earn a Department-issued "Area of Concentration."

Qualified students may apply for early-entry into the graduate program in Civil Engineering during their junior or senior year. If accepted, students may take these optional courses for graduate credit and to begin work on their master's degree while completing their undergraduate degree.

Early-Entry to Master's Program in Civil Engineering

1. A student may be accepted into the early-entry program at any time after completion of at least 75 semester hours of undergraduate work applicable to an appropriate degree. Admission must be approved by the Department of Civil Engineering. Full admission to the graduate program is conditional pending the awarding of the undergraduate degree.
2. In order to be accepted into the program a student must have at least a 3.2 overall grade point average and a 3.2 grade point average in the student's major. The successful applicant must have taken the appropriate standardized test and earned acceptable scores.
3. While in the early-entry program, a student must maintain a 3.0 overall grade point average through completion of the baccalaureate degree in order to remain in the graduate program.
4. Students accepted into the early-entry program will be subject to the same policies that pertain to other matriculated graduate students. Early-entry students must finish their undergraduate degree before they complete 15 hours of graduate work.

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (B.S.C.E.)

This curriculum became effective Fall 2000. Students who entered the program prior to Fall 2000 should refer to a previous catalog or contact the Department office for their program of study. Since the curriculum changes periodically, students should contact the Department office for the latest information concerning this curriculum.

A major in Civil Engineering leading to the B.S.C.E. degree consists of 123 credit hours. Specific requirements are:

English.....	6
Technical Communications.....	3
Humanities and Social Science Electives	15
Mathematics.....	15
Physics.....	8
Chemistry	4
Science Elective	3
Engineering.....	4
Electrical or Mechanical Engineering	3
Engineering Science.....	6
Departmental Requirements.....	35
Open Technical Electives	9
Civil Engineering Technical Electives	12
Total	123

Social science and humanities electives must be chosen both to satisfy University General Education requirements and to meet the objectives of a broad education consistent with the educational goals of the profession. To avoid taking "extra" humanities/social science electives, students must select their electives carefully after consulting with their faculty adviser.

The science electives must be chosen from an approved list of physical, life, or earth sciences and must complement the student's overall educational plan.

Technical electives allow flexibility for study in specific areas, and each student may design a technical elective program with the advisor's approval in order to achieve an individual goal and follow a desired track. Three "open" technical (TECH) electives may be selected from the areas of engineering, mathematics, science, business and communications. Four Civil Engineering technical (CEGR TECH) electives must be selected from upper-division Civil Engineering courses.

CURRICULUM OUTLINE: B.S.C.E. DEGREE (effective Fall 2003)

Freshman Year		
MATH 1241	Calculus I.....	3
CHEM 1251	Chemistry I.....	3
CHEM 1251L	Chemistry Lab	1
ENGL 1101	English I.....	3
ENGR 1201	Introduction to Engineering I.....	2
LBST 1101, 1102, 1103, 1104 or 1105	– Gen Ed.....	3
		15
MATH 1242	Calculus II	3
PHYS 2101	Dynamics	3
PHYS 2101L	Physics Lab	1
ENGL 1102	English	3
ENGR 1202	Introduction to Engineering II.....	2
Social Science	Gen Ed	3
		15
Sophomore Year		
MATH 2241	Calculus III.....	3
PHYS 2102	Electricity	3
PHYS 2102L	Physics Lab	1
CEGR 2101	Drawing	2
CEGR 2102	Engineering Economics	3
MEGR 2141	Statics (Engr. Mech. I).....	3
LBST 2101	Gen Ed.....	3
		18

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MATH 2171	Differential Equations	3
STAT 3128	Probability and Statistics for Engrs.....	3
ENGL 2116	Technical Writing (W).....	3
CEGR 2104	Surveying & Site Design	3
CEGR 2154	Design Project Lab (O)	2
MEGR 2144	Solid Mechanics	3
		17

Junior Year

CEGR 3122	Structures I	3
CEGR 3141	Environmental I	3
CEGR 3143	Hydraulics & Hydrology.....	3
CEGR 3161	Transportation I	3
CEGR 3278	Geotechnical I	3
		15

CEGR Lab	Elective (W)	1
CEGR Lab	Elective (W)	1
CEGR	Elective.....	3
CEGR	Elective.....	3
Science	Elective	3
LBST 2102	Gen Ed.....	3
Engineering	Elective: ECGR 2161-Circuits or MEGR 3121-Dynamics or MEGR 3111-Thermodyn.....	3
Optional Course A		(3)
		17

Senior Year

CEGR 3201	Systems and Design I	3
CEGR 3282	Professional Development.....	1
CEGR	Elective	3
TECH	Elective	3
LBST 2211, 2212, 2213, 2214 or 2215 – Gen Ed		3
* Optional Course B		(3)
		13

CEGR 3202	Systems and Design II	3
CEGR Lab	Elective (W).....	1
CEGR	Elective	3
TECH	Elective	3
TECH	Elective	3
* Optional Course C		(3)
		13

Total Required Hours 123

Note: (W) indicates a writing intensive course
(O) indicates an oral communication course

*Contact the Department office for more information about the optional courses and their use for an undergraduate concentration or for the early-entry Master's program.

Department of Electrical and Computer Engineering

Chairperson: Professor Tranjan; *Professors:* Bobbio, Coleman, Daneshvar, Fiddy, Kakad, Lukic, Makki, Phillips, Stroud, Tsu; *Professor Emeritus:* Greene; *Associate Professors:* Binkley, Hasan, Howitt, Miri, Stokes, Weldon; *Associate Professor Emeritus:* Smith; *Assistant Professors:* Nasipuri, Mukherjee; *Faculty Associate:* Hudak.

The Electrical and Computer Engineering Department provides instruction and research in areas of electrical and computer engineering such as electronics, microelectronics, optoelectronics, power systems, control theory, digital systems, communications, and VLSI design.

The Department offers a **Bachelor of Science in Electrical Engineering (B.S.E.E.) degree and a Bachelor of Science in Computer Engineering (B.S.Cp.E.) degree.** An eight-semester sequence of courses that is designed to develop the concepts and design and analysis techniques fundamental to the various areas of specializations forms the core of the curricula. Emphasis is placed on the utilization of computers throughout the curricula.

Graduate studies in electronics, microelectronics, optoelectronics, computer engineering, VLSI design and testing, signal processing, communications, and power and control systems are offered by the Department at the master's level. The Department also offers a doctoral degree with emphasis in microelectronics, optoelectronics, or computer engineering.

Early-entry to the Master of Science Program in Electrical Engineering

1. A student may be accepted into the early-entry program at any time after completion of 75 semester hours of undergraduate work applicable to an appropriate degree. Admission must be approved by the Department of Electrical and Computer Engineering. The admission is conditional pending the awarding of the undergraduate degree.
2. In order to be accepted into the Electrical Engineering early-entry program, an undergraduate student must have at least a 3.2 overall grade point average and a 3.2 grade point average in the major. The successful applicant must have taken the appropriate graduate standardized test and achieved acceptable scores.
3. If an early-entry student is unable to maintain a 3.0 overall grade point average at the end of his/her baccalaureate degree, he/she will be dismissed from the graduate program.
4. Up to six hours earned at the graduate level may be substituted for required undergraduate hours. (Up to six hours of graduate work may be "double counted" toward both baccalaureate and graduate degrees.)
5. Students accepted into the early-entry program will be subject to the same policies that pertain to other matriculated graduate students. Early-entry students must finish their undergraduate degree before they complete 15 hours of graduate work.

The program in Electrical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202 - Telephone (410) 347-7700

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (B.S.E.E.)

The curricula described are subject to change. Please consult with the Chair or the Undergraduate Coordinator for the latest versions.

A major in Electrical Engineering leading to the B.S.E.E. degree consists of a total of 127 credit hours.

The **Program Educational Objectives** are as follows:

- To provide our students the opportunity and the environment to acquire the educational background necessary to pursue professional careers in Electrical Engineering and/or to continue their education toward an advanced degree in the field.
- To provide graduates who have a comprehensive background in mathematics, physical and social sciences, liberal arts, and human values, with in-depth knowledge of the fundamentals of engineering science and Electrical Engineering that perpetuates life-long learning.
- To provide graduates with the tools to pursue successful and long careers in the profession that places ethical conduct as paramount.
- To prepare graduates who can effectively communicate their thoughts and ideas to their surroundings along with the understanding of the impact of electrical engineering on global, societal, and environmental issues.
- To provide graduates who have state-of-the-art computer skills suitable for a modern career in electrical engineering, where computer utilization is an essential tool.

The laboratory courses are designed to: (1) teach the basic techniques of instrumentation; (2) develop skills in communications; and (3) relate the analytical methods developed in the classroom to the performance of real physical systems.

The degree requirements are:

English.....	6
Liberal Studies.....	18
Mathematics.....	15
Physics.....	10
Chemistry.....	4
Science Elective.....	3
Engineering.....	5
Mechanical Engineering.....	3
Departmental Requirements.....	51
Technical Electives.....	9
Economics.....	3
127	

*One course in foreign language may be considered as HUM/SS.

The social science and humanities electives must include some courses at an advanced level and be chosen to satisfy the University General Education requirements and to meet the objectives of a broad education consistent with the educational goals of the profession.

The science elective must be chosen from the physical, life, or earth sciences and must complement the student's overall educational plan.

The technical electives are chosen by students in consultation with their academic advisor. Students can use these electives to (1) obtain some breadth within electrical engineering by choosing additional advanced courses; (2) obtain significant depth within a particular area of electrical or computer engineering; and (3) prepare for graduate work in electrical or computer engineering. The technical electives must contain at least nine hours of coursework dealing with engineering science, analysis, synthesis, or design. See Department guidelines for selection of these courses.

All junior-level core courses must be satisfactorily completed prior to enrolling in the senior project courses.

CURRICULUM OUTLINE: B.S.E.E. DEGREE

Freshman Year

ENGR 1201 - Intro. To Engr. Pract. & Prin. I.....	2
MATH 1241 - Calculus I.....	3
CHEM 1251 - Principles of Chemistry.....	3
CHEM 1251L - Chemistry Lab.....	1
ENGL 1101 - English Composition.....	3
LBST 1101, 1102, 1103, 1104 or 1105.....	3
15	

ENGR 1202 - Intro. To Engr. Pract. & Prin II.....	2
MATH 1242 - Diff & Integral (Cal II).....	3
PHYS 2101 - Physics: Dynamics.....	3
PHYS 2101L - Physics Lab.....	1
ENGL 1102 - Composition & Literature.....	3
Social Science (Gen Ed).....	3
15	

Sophomore Year

ECGR 2111 - Network Theory I.....	3
ECGR 2103 - Computer Utilization in C++.....	2
ECGR 2181 - System Design I.....	3
PHYS 2102 - Electricity & Mag.....	3
MATH 2171 - Differential Equations.....	3
ECGR 2155 - Lab: Logic & Networks.....	1
15	

ECGR 2112 - Network Theory II.....	3
PHYS 3141 - Introduction to Modern Physics.....	3
MATH 2241 - Calculus III.....	3
LBST 2101.....	3
ECGR 2252 - Electrical Engineering Design I.....	2
ECGR 2156 - Lab: Instrumentation and Networks.....	1
15	

Junior Year

ECGR 2111 - Signals and Systems.....	3
ECGR 3157 - Electrical Engineering Design II.....	2
ECGR 3131 - Fund of Electronics & Semiconductors.....	3
ECGR 3121 - Introduction to Electromagnetic Fields.....	3
LBST 2102.....	3
ENGR 3295 - Professional Development.....	1
ECGR 3155 - Lab: Systems and Electronics.....	1
16	

LBST 2211, 221, 2213, 2214 or 2215.....	3
ECGR 3142 - Electromagnetic Devices.....	3
ECGR 3132 - Electronics.....	3
ECGR 3122 - Electromagnetic Waves.....	3

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STAT 2122 - Probability and Statistics	3
ECGR 2156 - Lab: Electromagnetic and Electronic Devices	1
	16

Senior Year

ECGR 3253 - Senior Design I	2
ECGR Senior Elective	3
Technical Elective	3
Science Elective	3
Communication Theory	3
Economics	3
	17

ECGR 3259 - Senior Design II.....	3
Thermodynamics.....	3
Technical Elective.....	3
Technical Elective.....	3
Writing Intensive.....	3
ECGR 3159 - Elec. Engineering Professional Practice.....	2
	17

Total Hours 127

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING (B.S.Cp.E.)

The curriculum in Computer Engineering leading to the B.S.Cp.E. degree consists of 125 semester credit hours. The curriculum was developed to meet the following **Program Educational Objectives**:

- Provide our students a solid foundation in the field of computer engineering within an environment that fosters hands-on design and synthesis experience.
- Prepare our students for leadership positions by providing a balanced educational experience with emphasis on communication skills, team-work, and professional practice, including values and ethics.
- Provide sufficient curriculum flexibility to allow every student to synthesize a program of study that is specific to the students' interests within the diverse field of computer engineering.
- Provide our students sufficient breadth of knowledge to understand the broad relationships of the various areas within engineering, and sufficient depth as a concentration within one of those areas.

The following curriculum became effective for all students entering the program in the summer of 2002 and thereafter. Students who entered the program prior to the summer of 2002 should consult earlier versions of the catalog or contact the ECE department.

The degree requirements consist of the following:

University Goals. 48 hours meeting and surpassing the University General Education requirements, including a technical writing course, nine hours of math, and 12 hours of science.

Core 1. Advanced Problem Solving: Nine hours of advanced problem solving courses.

Core 2. Computer Engineering: 39 hours of computer engineering including introduction to engineering, programming and data structures, network theory, electronics, logic design, data communications, and computer organization and architecture.

Breadth. 12 hours of electives, where the student chooses one course from each of four areas.

Depth. Six hours of electives, where the student chooses two courses from one of the chosen breadth areas. Combined with the Breadth requirement, this results in a minimum of nine hours in a concentration area.

Professional Development and Practice: One hour of professional development and two hours of professional practice.

Senior Design Capstone. Five hours of senior design project.

Restricted Electives. Three hours of engineering, computer science, math, physics, chemistry, or biology at the 2xxx level or above.

Total: 125 semester hours.

CURRICULUM OUTLINE: BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

University Goals - 48 hours

- I. Communication: ENGL 1101, ENGL 1102, ENGL 2116 (technical writing); COMM – choose one course from {COMM 1101, COMM 2105, or COMM 2107}12
- II. Problem Solving: MATH 1241, 1242; STAT 2122.....9
- III. Social Science : Choose one course from {ANTH 1101, GEOG 1105, ECON 1101, ECON 2101, POLS 1110, or SOCY 1101}.....3
- IV. Science: PHYS 2101/L, PHYS 2102L, CHEM 1251/L.....12
- V. Liberal Studies/Arts & Society: Choose one course from {LBST 1101, 1102, 1103, 1104 or 1105} 3
- VI. Liberal Studies/Western: LBST 2101.....3
- VII. Liberal Studies/Global: LBST 2102.....3
- VII.I. Liberal Studies/Ethical & Cultural issues: Choose one course from {LBST 2211, 2212, 2213, 2214, or 2215}.....3

Core 1. Advanced Problem Solving – Nine hours
MATH 1165, MATH 2171 and one course from:
{MATH 2164, OPRS 3111, OPRS, 3113, or PHYS 3141}9

Core 2. Computer Engineering – 39 hours
Core 1 & 2 Subtotal.....48

Breadth: Choose one course from those indicated by a # sign (see next section) from four different concentration areas: Design & Test, Communications, Device Electronics & Technology, Computer Architecture/Software Systems. Where a course is applicable to more than one concentration area, the students must identify a particular area to which they are applying the course: “double-dipping” is not allowed.....12

Depth: Two additional ECGR courses at 3XXX or above, chosen from one of the breadth areas.....6

Senior Design Capstone:.....5

Professional Development:1

Professional Practice:2

Restricted Electives: One 2XXX or above (COE or MATH/STAT/PHYS/CHEM/BIOL/ITCS) course.....3

Total Hours.....125

Breadth/Depth Electives

Breadth Electives Requirement - choose one course with a # designation from each of the four areas listed below.

Depth Elective Requirement - choose two additional ECGR courses from one of the four areas. Courses not on the following list may be approved on a course by course basis.

1. Design & Test

- #ECGR 3182 Digital Electronics
- #ECGR 4146 Intro to VHDL
- #ECGR 4182 Digital System Testing
- ECGR 4132 Analog Integrated Circuits Design
- #ECGR 4433 VLSI Systems Design
- #ITCS 3183 Hardware Systems Design
- #ITCS 4181 Microcomputer Interfacing

2. Communications

- #ECGR 3112 Systems Analysis II
- #ECGR 4124 Digital Signal Processing
- ECGR 4125 Fund of Optical Engineering
- #ECGR 4132 Analog & Digital Communication
- ECGR 4187 Data Communications
- #ITCS 4165 Coding and Information Theory
- #ITCS 3166 Distributed Comp Info Sys
- #ITCS 3134 Digital Image Processing

3. Device Electronics & Technology

- #ECGR 3132 Electronics II
- #ECGR 4131 Linear Integrated Microelectronics
- #ECGR 3133 Solid State Microelectronics I
- ECGR 4134 Solid State Microelectronics II
- #ECGR 4137 Device Electronics for ICs
- ECGR 4138 Electronic Thin Film Devices
- ECGR 4140 Intro to VLSI Processing
- #ECGR 4125 Foundation of Optical Engineering
- #ECGR 4165 Laser Electronics

4. Computer Architecture/Software Systems

- #ITCS 2214 Data Structures
- #ITCS 4183 Computer Arithmetic
- #ITCS 3145 Intro to Parallel Programming
- #ITCS 3183 Hardware System Design
- ECGR 4182 Digital System Testing
- ECGR 4146 Introduction to VHDL
- #ITCS 3160 Data Base Design
- #ITCS 4141 Computer Organization & Architecture
- #ITCS 4181 Microcomputer Interfacing

EXAMPLE PLAN OF STUDY: B.S.Cp.E. DEGREE

Freshman Year

- ITCS 1214 - Introduction to Computer Science I3
- MATH 1241 - Calculus I3
- ENGL 1101 - Composition3
- ENGR 1201 – Intro to Engineering I2
- CHEM 1251 - Principles of Chemistry3
- CHEM 1251L - Principles of Chemistry Lab1
- 15

- ITCS 1215 - Introduction to Computer Science II3
- MATH 1242 - Calculus II3
- ENGL 1102 - Writing in Acad. Com.3
- ENGR 1202 - Intro to Engineering II2
- PHYS 2101 - Physics for Science/Engineering I3
- PHYS 2101L - Physics for Science/Engineering I Lab1
- 15

Sophomore Year

- ECGR 2181 - Logic System Design I3
- ECGR 2111 - Network Theory I3
- MATH 2171 - Differential Equations.....3
- ECGR 2155 - ECE Lab1
- LBST 1101, 1102, 1103, 1104 or 11053
- PHYS 2102 - Physics for Science/Engineering II.....3
- PHYS 2102L - Physics for Science/Engineering II Lab1
- 17

- ECGR 2112 - Network Theory II.....3
- ECGR 2156 - ECE Lab.....1
- MATH 1165 - Intro to Discrete Structures3
- STAT 2122 - Probability and Statistics3
- ANTH 1101, GEOG 1105, ECON 1101, ECON 2101, POLS 1110, or SOCY 11013
- Oral Communications3
- 16

Junior Year

- ECGR 3131 - Fund Electronics/Semi3
- ECGR 3155 - ECE Lab1
- ITCS 3182 - Computer Organization/Architecture3
- ECGR 3111 - Signals and Systems3
- Restricted Elective Selection3
- Breadth Elective #13
- ENGR 3295 - Professional Development.....1
- 17

- ECGR 3123 - Data Communication & Network.....3
- ECGR 3181 - Logic System Design II.....3
- Breadth Elective #23
- Advanced Problem Solving Selection3
- ECGR 2255 - ECE Lab2
- LBST 21013
- 17

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Senior Year

ECGR 3253 - Senior Project I	2
ENGL 2116 - Technical Writing.....	3
Breadth Elective #3	3
Depth Elective #1	3
LBST 2102	3
	14
ECGR 3254 - Senior Project II.....	3
ECGR 3159 - Professional Practice.....	2
Depth Elective #2.....	3
Breadth Elective #4	3
LBST 2211, 2212, 2213, 2214 or 2215	3
	14

Total Hours 125

The computer engineering website at <http://www.ece.uncc.edu/cmpgr> contains a wealth of information, including a complete student handbook and a facility for easily browsing required course prerequisite information. The student's are strongly encouraged to review the website.

Department of Engineering Technology

Chairperson: Professor Brizendine; *Professors:* Byars, Sherlock; *Associate Professors:* Ahmad, Barry, Braun, Carter, Liou, Mobley, Orozco, Priebe, Wang; *Assistant Professors:* Gehrig, Kimble, Kuyath, Murphy, Ramers, Sharer, Watkins; *Visiting Assistant Professor:* Owen; *Professors Emeritus:* Liu.

Engineering and technical education have undergone considerable change in the last 30 years. The complexities of space exploration, nuclear power, communications systems, environmental control, information processing, transportation systems, fire protection and manufacturing have demanded a great increase in the involvement of professional engineers in theoretical and analytical work. This has resulted in a much greater emphasis upon research and development, science, and mathematics in professional engineering curricula. At the same time, after the more complex devices and systems have been engineered, the design, development, and operation require the sophisticated knowledge and skills of what might be called the "applied engineering sciences." Programs dedicated to filling this need exist all over the United States. The aim and content of these programs are distinctly different from professional engineering curricula.

To provide the appropriate distinction from both theoretical-professional engineers and from engineering technicians who are graduated from the two-year community and technical colleges, the designation "engineering technologist" is employed to describe the graduates of four-year applied engineering or "engineering technology" curricula. The Engineering Technology Department is committed to producing competent graduates that satisfy the needs of employers in North Carolina and beyond.

The two-year community and technical college programs in North Carolina and in many other states provide an excellent foundation for matriculation into the four-year baccalaureate engineering technology programs. Therefore, the Engineering Technology Department at UNC Charlotte admits transfer students holding an Associate in Applied Science degree in engineering technology (or similar titles), fire science, or fire protection. Currently, the program is provided as upper-division only but planning is progressing for admission of freshmen and transfers within the lower division.

UNC Charlotte offers four curricula leading to a Bachelor of Science in Engineering Technology (B.S.E.T.) degree: **Civil Engineering Technology** (emphases on General Civil Engineering Technology and on Construction Engineering Technology); **Electrical Engineering Technology** (emphasis on Electronics Engineering Technology and Computer Engineering Technology); **Fire Safety Engineering Technology**; and **Mechanical Engineering Technology**.

UNC Charlotte is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Land, Decatur, Georgia 30033-4097: telephone number 404-679-4501) to award baccalaureate, master's, intermediate, and doctoral degrees.

In addition, the Civil, Electrical and Mechanical Engineering Technology programs of study in Engineering Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21202: telephone number 410-347-7700).

Distance Education Options. In addition to the on campus programs, the BSET programs in **Electrical Engineering Technology** and **Fire Safety Engineering Technology** are offered over the Internet to part time students. Students are required to come to the campus only for an initial orientation and for ELET laboratories. The ELET laboratories are currently offered on a schedule of Saturdays during the summer school sessions. Estimated completion time for these degrees is four years.

ENGINEERING TECHNOLOGY PROGRAM EDUCATION OBJECTIVES AND OUTCOMES

Program Educational Objectives: These are statements that describe the expected accomplishments of graduates during the first few years after graduation.

The Department of Engineering Technology at UNC Charlotte is committed to providing the environment and expertise to ensure that its graduates make substantive contributions in their professional endeavors after graduation, both in the areas of technical proficiency and community involvement. Accordingly, Civil, Electrical, Fire Safety, and Mechanical Engineering Technology program alumni contribute to society as productive technologists and engaged citizens by:

1. Applying general and discipline-specific concepts and methodologies to identify, analyze, and solve technical problems.
2. Articulating technical material in a professional manner to potentially diverse audiences and in a variety of circumstances, employing effective oral

and written strategies and techniques.

3. Contributing within team environments, demonstrating ethical, respectful and professional behavior in all associations.
4. Recognizing and appreciating the environmental, societal and fiscal impact of the technical professions in a local, national and global context.
5. Demonstrating an individual desire and commitment to pursue continuous self-improvement and lifelong learning.

Program Outcomes: These are statements that describe what students are expected to know and able to do by the time of graduation. Graduates with a Bachelor of Science in Engineering Technology (B.S.E.T.) degree from UNC Charlotte will be able to:

1. Utilize contemporary and discipline specific tools to acquire data, analyze problems, and implement current and emerging technology into the design of a system or process to satisfy defined criteria and achieve desired results.
2. Participate as a contributing member in the development, refinement and presentation of interdisciplinary and collaborative projects.
3. Engage in the pursuit of the knowledge and skills necessary and consistent with, the expectations of a practicing engineering technologist.
4. Articulate, through oral and written reports and presentations, the viability of creative, logical and realistic solutions to defined problems and projects.
5. Recognize and respect the value of diversity, as well as the significance of ethical and societal issues, while completing assigned business and technical tasks with professional quality and in a timely manner.
6. Analyze and solve complex problems that involve applications in area(s) of specific program expertise, while demonstrating knowledge of mathematical and scientific principles fundamental to those areas defined by each discipline.

The Engineering Technology programs identify, measure, and improve student competencies through assessment and continuous improvement of program outcomes, which are mapped to the TAC of ABET Criterion 1 (a through k) criteria listed below:

TAC of ABET “a through k” Skills

ABET a: Graduates are expected to demonstrate an appropriate mastery of the knowledge, techniques, skills, and modern tools for their disciplines.
ABET b: Graduates are expected to be able to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.
ABET c: Graduates will conduct, analyze, and interpret experiments and apply experimental results to improve processes.
ABET d: Graduates are expected to be able to apply creativity in the design of systems, components, or processes appropriate to program objectives
ABET e: Graduates are expected to be able to function effectively on teams.
ABET f: Graduates are expected to be able to identify, analyze, and solve technical problems.
ABET g: Graduates are expected to be able to communicate effectively.
ABET h: Graduates are expected to be able to recognize the need for and possess the ability to pursue lifelong learning.
ABET i: Graduates are expected to be able to understand professional, ethical, and social responsibilities.
ABET j: Graduates are expected to be able to recognize contemporary professional, societal, and global issues and are aware of and respect diversity.
ABET k: Graduates are expected to have a commitment to quality, timeliness, and continuous improvement.

BACHELOR OF SCIENCE IN ENGINEERING TECHNOLOGY (B.S.E.T.)

Requirements for Admission. A student who has graduated from a community or technical college must meet the following requirements to enter the Engineering Technology program at UNC Charlotte:

1. An Associate in Applied Science degree in one of the following fields: Architectural, Automation, Building Construction, Civil, Construction, Computer, Controls, Design and Drafting, Electrical, Environmental, Fire Protection, Fire Science, Optical, Electronics, Industrial, Instrumentation, Manufacturing, Mechanical, Robotics, Surveying Technology, or similar title with curriculum acceptable to the Department;
2. An overall grade point average of at least 2.2 (based on the 4.0 system) on all courses taken at the technical institute or community college; and
3. Satisfactory completion of the prerequisite background courses for the program emphasis that the student plans to enter.

There is considerable variance in the contents of technical programs throughout the United States. Should this result in entrance deficiencies, the student can usually remove these deficiencies at a community or technical college prior to admission to UNC Charlotte, or during the first year at UNC Charlotte.

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Residence Requirements. A student must earn the last 30 semester hours of credit toward the degree and the last 12 semester hours of work in the major at this University to satisfy residence requirements.

Experiential Learning Requirements. All students graduating after August 1999 must complete at least one experiential course. Experiential courses are practice-oriented courses such as cooperative education, internships, senior design projects, or undergraduate research.

Academic Requirements and Discontinuance Conditions in Engineering Technology. These requirements apply to majors in all programs leading to the B.S.E.T. Degree. These programs are Civil Engineering Technology, Electrical Engineering Technology, Fire Safety Engineering Technology, and Mechanical Engineering Technology. In addition to University and College of Engineering conditions, a student who is admitted to any BSET program without meeting ALL published admission requirements is expected to remove all admission deficiencies within one year. Violators are subject to discontinuance.

Course Requirements. Prerequisite courses for entering the Engineering Technology program, normally taken at a technical institute or community college, are listed on the pages that follow. Courses that must be completed at UNC Charlotte are listed in the Engineering Technology curricula that follow.

Prerequisites for admission to the Civil, Electrical, and Mechanical Engineering Technology Programs. Students must have satisfactorily completed the following subjects in their two-year associate degree program:

- English Composition, Technical Writing and/or Public Speaking (6 semester hours)
- Algebra Trigonometry, Analytic Geometry, Differential and Integral Calculus (9- 12 semester hours)
- General Physics (with laboratory) (4 semester hours)
- Physics or Chemistry (with laboratory) (4 semester hours) or Geology (for CIET)
- Humanities or Social Sciences (3-6 semester hours)
- Technical Courses in Major Area as listed under Discipline Specific Prerequisites below (32-38 semester hours)

Total maximum transfer credit from two-year college is 64 semester hours.

Discipline Specific Prerequisites:

Civil

- Computer Aided Drafting
- Surveying
- Statics
- Strength of Materials

Electrical

- Electrical Drafting
- Computer Programming (BASIC, FORTRAN, PASCAL, C, C++, or some high order language)

- D.C. Circuits
- A.C. Circuits
- Digital Circuits
- Semiconductor Circuits
- Communications, Electronics, Control Systems or Microcomputers

Mechanical

- Drafting/Computer Aided Drafting
- Machine Processes
- Statics
- Metallurgy or Engineering Materials
- Kinematics or Mechanisms
- Basic Electrical Circuits or Physics II (Electricity)
- Computer Programming (using a higher level language such as Visual Basic, FORTRAN, or C++)

Prerequisites for admission to the Fire Safety Engineering Technology Program. Students must have satisfactorily completed the following subjects in their two-year associate degree program:

- English Composition, Technical Writing and/or Public Speaking (6-9 semester hours)
- Algebra (3 semester hours)
- Two science courses with a laboratory (8 semester hours)
- Humanities and/or Social Sciences (6-9 semester hours)
- Computer Literacy Course
- Technical Courses in Major Area as listed below (32-38 semester hours)

- Introduction to Fire Protection
- Fire Prevention and Public Education
- Fire Detection and Fire Investigation
- Building Construction
- Inspections and Codes
- Sprinklers and Automatic Alarms
- Fire Protection Law
- Fire Fighting Strategies
- Chemistry of Hazardous Materials
- Hydraulics and Water Distribution
- Managing Fire Services

**CIVIL ENGINEERING TECHNOLOGY PROGRAM
General Civil Engineering Technology Emphasis**

Junior Year

ETGR 3071	Engineering Tech. Prof. Seminar	1
ETCE 3111	Structural Analysis I	3
ETCE 3121	Foundations and Earthwork	3
ETCE 3151	Soil Testing Laboratory	1
ETGR 3222	Engineering Economics	3
Directed Electives (see Note a)	6
		17
ETCE 3112	Structural Analysis II	3
ETCE 3132	Hydraulics	3
ETGR 3171	Engineering Analysis I	3
ETCE 3150	Hydraulics & Materials Lab	1
Directed Electives (see Note a.)	3
		13

Senior Year

ETCE 3212	Structural Steel Design.....	3
ETCE 3252	Environmental Laboratory	1
ETCE 3262	Intro to Environmental Engineering	3
ETGR 3272	Applied Numerical Methods.....	3
CHEM 1251	Principles of Chemistry or GEOL 1200 Physical Geology (both with lab)	4
Major Elective (see Note b.)		3
		17

ETCE 3642	Senior Design Project.....	2
ETCE 3211	Reinforced Concrete Design.....	3
ETCE 3241	Highway Design & Construction.....	3
Major Elective (see Note b.)		3
Directed Elective (see Note a.)		3
		14

CIVIL ENGINEERING TECHNOLOGY PROGRAM Construction Engineering Technology Emphasis

Junior Year

ETGR 3071	Engineering Tech. Prof. Seminar	1
ETCE 3111	Structural Analysis I	3
ETCE 3121	Foundations & Earthwork	3
ETCE 3151	Soil Testing Lab	1
ETGR 3222	Engineering Economics	3
Directed Electives (see Note a.)		6
		17

ETCE 3112	Structural Analysis II.....	3
ETCE 3132	Hydraulics	3
ETCE 3150	Hydraulics & Materials Lab.....	1
ETGR 3171	Engineering Analysis I.....	3
ETCE 3281	Cost Estimating I.....	3
Directed Elective (see Note a.).....		3
		16

Senior Year

GEOL 1200	Physical Geology with Lab	4
ETCE 3211	Structural Steel Design.....	3
ETCE 3243	Project Management Technology.....	3
ETCE 3253	Construction Eng. Tech. Field Lab	1
Major Elective (see Note b.)		3
Directed Elective (see Note a.)		3
		17

ETCE 3211	Reinforced Concrete Design.....	3
ETCE 3293	Mechanical & Electric Systems for Buildings	3
ETCE 3642	Senior Design Project.....	2
Major Elective (see Note b.)		3
Directed Elective (see Note a.)		3
		14

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAM

Computer Engineering Technology Emphasis

Junior Year

ETGR 3071	Engineering Tech. Prof. Seminar	1
ETEE 3133	Linear Networks I	3
ETEE 3153	ETEE Laboratory I (W).....	1
ETGR 3171	Engineering Analysis I.....	3
ETEE 3183	Digital Logic Design	3
Directed Elective (see Note a.).....		3
		14

CHEM 1251	Principles of Chemistry	3
ETEE 3124	Linear Networks II.....	4
ETEE 3156	ETEE Laboratory II (W).....	1
ETEE 3285	Assembly Language Programming.....	3
Directed Elective (see Note a.).....		3
		14

Senior Year

ETEE 3211	Active Networks I.....	3
ETEE 3255	ETEE Laboratory IIIC (W).....	1
ETEE 3281	Computer Design	3
Major Elective (see Note b.)		3
Directed Electives (see Note a.)		6
		16

ETEE 3212	Active Networks II	3
ETEE 3275	Integrated Circuit Applications.....	3
ETEE 3286	Microcomputer Applications	3
ETEE 3641	Senior Design Project (W, O)	1
Major Elective (see Note b.)		3
Directed Elective (see Note a.)		3
		16

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAM

Electronics Engineering Technology Emphasis

Junior Year

ETGR 3071	Engineering Tech. Prof. Seminar	1
ETEE 3133	Linear Networks I	3
ETEE 3153	ETEE Laboratory I (W).....	1
ETGR 3171	Engineering Analysis I.....	3
ETEE 3183	Digital Logic Design	3
Directed Elective (see Note a.)		3
		14

CHEM 1251	Principles of Chemistry	3
ETEE 3124	Linear Networks II.....	4
ETEE 3156	ETEE Laboratory II (W).....	1
ETEE 3285	Assembly Language Programming.....	3
Directed Elective (see Note a.).....		3
		14

Senior Year

ETEE 3211	Active Networks I.....	3
ETEE 3213	Industrial Electronics.....	1
ETEE 3257	ETEE Laboratory IIIE (W)	3
Major Elective (see Note b.)		3
Directed Electives (see Note a.)		6
		16

ETEE 3212	Active Networks II	3
ETEE 3214	Operational Amplifiers.....	3
ETEE 3222	Automatic Controls	3
ETEE 3641	Senior Design Project (W,O)	1
Major Elective (see Note b.)		3
Directed Elective (see Note a.).....		3
		16

FIRE SAFETY ENGINEERING TECHNOLOGY PROGRAM

Junior Year

ETFS 3103	Principles of Fire Behavior	3
ETFS 3113	Building Fire Safety	3
ETFS 3123	Industrial Hazards & Electricity.....	3
ETGR 3222	Engineering Economics	3

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ETFS 3611 Professional Leadership Seminar	1
Directed Elective (<i>see</i> Note a)	3
	16
ETFS 3124 Risk Management for Emergency Services	3
ETFS 3144 Active Fire Protection	3
POLS 3119 State Politics	3
PSYC 2171 Introduction to Industrial/Organizational Psychology	3
Directed Elective (<i>see</i> Note a)	3
	15

Senior Year

ETFS 3183 Fire Safety Engineering Problem Analysis	3
ETFS 3233 Applied Fire Engineering Design and Analysis	3
POLS 3121 Urban Politics	3
PSYC 3174 Organizational Psychology	3
Directed Elective (<i>see</i> Note a)	3
	15
ETFS 4123 Command & Control of Major Disasters.....	3
ETFS 4243 Research Investigation.....	3
ETFS 4323 Advanced Fire Service Administration.....	3
POLS 3126 Administrative Behavior.....	3
Directed Elective (<i>see</i> Note a)	3
	15

MECHANICAL ENGINEERING TECHNOLOGY

Junior Year

ETGR 3071 Engineering Tech. Prof. Seminar	1
ETME 3123 Strength of Materials	3
ETME 3133 Fluid Mechanics	3
ETME 3152 Stress Analysis Laboratory	1
ETGR 3171 Engineering Analysis I	3
Directed Elective (<i>see</i> Note a)	3
	14
CHEM 1251 Principles of Chemistry	3
ETME 3113 Dynamics	3
ETME 3143 Thermodynamics	3
ETME 3151 Fluid Mechanics Laboratory	1
ETGR 3222 Engineering Economics	3
Directed Elective (<i>see</i> Note a)	3
	16

Senior Year

ETME 3213 Machine Design I	3
ETME 3232 Senior Design Project I	2
ETME 3252 Thermodynamics Laboratory	1
ETGR 3272 Applied Numerical Methods.....	2
Major Elective (<i>see</i> Note b)	3
Directed Elective (<i>see</i> Note a)	3
	15
ETME 3242 Senior Design Project II.....	2
ETME 3251 Instrumentation Lab	1
ETME 3163 Instrumentation & Controls	3
Major Elective (<i>see</i> Note b)	3
Directed Electives (<i>see</i> Note a)	6
	15

Notes regarding Curriculum Outlines.

a. Directed electives may be major field courses or general education courses. They are chosen jointly by

student and advisor to ensure that all graduation requirements are met.

b. Major elective courses must be upper-division courses offered by the William States Lee College of Engineering or courses related to the student's field of specialization and approved by the Department as major electives. Major elective courses are all 3000 level or above courses in the college of engineering plus, upon written approval by advisor, ITCS 2116, STAT 122X, GEOG 3150, OPER 3100, and PSYC 2171.

Department of Mechanical Engineering and Engineering Science

Chairperson: Professor Jayaraman Raja; *Bonnie E. Cone Distinguished Professor in Teaching:* Mohanty; *Norvin Kennedy Dickerson Jr. Distinguished Professor:* Hocken; *United Dominion Industries Distinguished Professor:* Patterson; *Professors:* Hari, Johnson, Leamy, Scott Smith, Stuart Smith; *Associate Professors:* Cogger, Cuttino, Davies, Estrada, Hari, Keanini, Micklow, Munday, Wilhelm; *Assistant Professors:* Cherukuri, Lee, Morse, Rogers; *Visiting Assistant Professor:* Lawton; *Senior Lecturer:* Hill; *Lecturer:* Raquet; *Adjunct Professors:* Marlburg, Peindl, Thubrikar

Mechanical engineering is possibly the broadest of the engineering disciplines. Mechanical engineers are involved in almost all aspects of the technological problems facing today's society. Among the major concerns of the mechanical engineer are problems related to conversion, utilization and conservation of our limited energy resources. Additional important areas for the mechanical engineer include the design and analysis of machines, structures and manufacturing processes related to the industrial output of the nation. Increasingly this design and analysis is computer based using the techniques of computer-aided design (CAD/CAM).

A sound understanding of the engineering sciences is fundamental to the education of engineers in every discipline. The engineering sciences are generally identified as those areas of engineering that emphasize the application of the fundamental principles of the physical sciences, primarily physics and chemistry, to engineering problems. Some classical and emerging engineering areas recognized to fall within this field include thermodynamics, fluid mechanics, engineering mechanics, engineering materials, nuclear and chemical sciences, microelectronics theory and fabrication, manufacturing, metrology, and the solid state sciences.

The Department of Mechanical Engineering and Engineering Science offers an undergraduate program leading to a Bachelor of Science in Mechanical Engineering (B.S.M.E.) degree and graduate programs leading to Master of Science in Mechanical Engineering (M.S.M.E.), Master of Science in Engineering (M.S.E.) and Doctor of Philosophy (Ph.D.) degrees. Using the flexibility provided by the technical electives, and with engineering career counseling, a student can develop a variety of educational programs that would provide the background for professional engineering licensing and practice in any of the areas included within mechanical engineering and/or the engineering sciences. The student can also prepare for graduate study in mechanical

engineering, materials science, or any of the recognized areas covered by the engineering sciences. Individualized study programs in one of the interdisciplinary fields involving the merger of engineering and the various science areas, such as bioengineering, microelectronics or chemical engineering sciences, can be developed.

The program objectives are as follows:

- To equip students to use analytical, computational, and statistical methods of engineering measurements and applications

- To develop the understanding of manufacturing methods so that graduates can contribute to the design, implementation and management of engineering systems.
- To prepare students to engage in the engineering design process by developing their skills at problem solving, planning, collaboration, and communication.
- To provide an education that allows graduates to understand the economic and ethical impact of their engineering decisions.
- To prepare students for successful participation as engineers in society, for graduate or professional studies, and for lifelong learning.

EARLY-ENTRY PROGRAM: the Master of Science in Mechanical Engineering

1. A student may be accepted into the early-entry Program at any time after completion of 90 semester hours of undergraduate work applicable to the B.S.M.E. degree. Admission must be approved by the Department Chair or Graduate Program Coordinator and admission is conditional pending the awarding of the undergraduate degree.

2. In order to be accepted to the Mechanical Engineering early entry program, an undergraduate student must have at least a 3.2 overall grade point average and a 3.2 grade point average in the major. The applicant must have taken the appropriate graduate standardized test (GRE) and received acceptable test scores.

3. Students accepted into the early-entry program will be subject to the same policies that pertain to other matriculated graduate students. Early-Entry students must finish their undergraduate degree before they complete 15 hours of graduate work.

The program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202 – Telephone (410) 347-7000.

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING (B.S.M.E.)

A major in Mechanical Engineering leading to the B.S.M.E. degree consists of a total of 122 credit hours.

These requirements are:
 English.....6

Written and Oral Communication.....	3
Liberal Studies.....	12
Economics.....	3
Mathematics.....	15
Physics.....	8
Chemistry.....	4
Science Elective.....	3
Electrical Engineering.....	3
Other Department Requirements.....	56
Technical Electives.....	9
Total	122

The social science and humanities electives must be chosen to satisfy University General Education requirements and to meet the objectives of a broad education consistent with the educational goals of the profession. This subject area must include some courses at an advanced level.

The science elective must be chosen from the physical, life, or earth sciences and must complement the student's overall educational plan to satisfy the college degree requirement.

Students must complete a statistics requirement by taking either STAT 3128 (Probability and Statistics for Engineers) or MEGR 3282 (Statistics Process Control and Metrology). STAT 3128 simultaneously counts as a mathematics or technical elective. MEGR 3282 counts as a technical elective. Students will not receive credit for both STAT 3128 and MEGR 3282. Students who fulfill the statistics requirement with MEGR 3282 may select their math elective from MATH 2164 or a 3000 level mathematics course approved by the Department.

The technical electives are chosen in consultation with the academic advisor. The student can use these electives to (1) obtain some breadth within the engineering sciences by choosing additional advanced courses from the various engineering sciences; (2) obtain significant depth within a particular area of mechanical engineering, or engineering science, through the use of available engineering science, mechanical engineering, science, mathematics and other engineering courses; and (3) prepare for graduate work in mechanical engineering, engineering science or some other engineering areas.

All mechanical engineering majors must satisfactorily complete ENGR 1201 during their first semester in attendance in mechanical engineering at UNC Charlotte. Mechanical engineering students must maintain a GPA of 2.0 in their major.

B.S.M.E. DEGREE IN MECHANICAL ENGINEERING

Common Freshman Year	
ENGR 1201 Intro to Engineering I.....	2
CHEM 1251 Chemistry I.....	3
CHEM 1251L Chemistry I Lab.....	1
MATH 1241 Calculus I.....	3
ENGL 1101 English I.....	3
LBST 1101, 1102, 1103, 1104 or 1105.....	3
	15
ENGR 1202 Intro to Engineering II.....	2
PHYS 2101 Physics I.....	3
PHYS 2101L Physics I Lab.....	1
MATH 1242 Calculus II.....	3
ENGL 1102 English II.....	3

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Social Science (Gen Ed)	3
	15

Sophomore Year

PHYS 2102 Physics II	3
PHYS 2102L Physics II Lab	1
MEGR 2141 Engineering Mechanics I	3
MATH 2241 Calculus III	3
ENGL 2116 Intro to Technical Communications	3
LBST 2101	3
	16

MEGR 2180 Manufacturing Systems	4
MEGR 2156 Design Project Lab I	2
MEGR 2144 Solid Mechanics	3
MATH 2171 Differential Equations	3
ECGR 2161 Basic Electronic Engineering	3
	15

Junior Year

MEGR 3111 Thermodynamics I	3
MEGR 3121 Dynamic Systems I	3
MEGR 3161 Engineering Materials	3
ECON 1201 or 1202 Economics	3
MEGR 3171 Measurements & Instrumentation	2
MEGR 3171L Instrumentation Laboratory	2
	16

MEGR 3112 Thermodynamics II	3
MEGR 3122 Dynamic Systems II	3
MEGR 3116 Heat Transfer	3
MEGR 3156 Design Project Lab II	2
MEGR 3114 Fluid Mechanics	3
MEGR 3152 Mechanics & Materials Lab	1
	15

Senior Year

MEGR 3255 Senior Design I	2
ME Technical Elective	3
Math Elective	3
LBST 2102	3
MEGR 3221 Machine Analysis & Design	3
MEGR 3251 Thermals/Fluids Lab	1
ENGR 3295 Professional Development	1
	16

MEGR 3256 Senior Design II	2
ME Technical Elective	3
ME Technical Elective	3
LBST 2211, 2212, 2213, 2214 or 2215	3
MEGR 3216 Thermal/Fluids Design	3
	14

TOTAL HOURS 122

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING (B.S.M.E.)

Concentration in Motorsports Engineering

The Motorsports Engineering concentration area is intended for students interested in specialized and systematic training and education in the area of automotive engineering as it pertains to motorsports. Students completing the requirements described in this program will receive a special designation on their transcripts showing that they have completed the Motorsports Engineering

concentration. Students must apply for admission and may enter the program during the sophomore or junior years only. To be admitted to the program students must have completed Physics I (PHYS 2101 & 2101L), Calculus I, II, and III (MATH 1241, 1242, and 2241), and Engineering Mechanics I (MEGR 2141), all with a grade of C or better and have a minimum GPA of 2.5.

The concentration area has three requirements:

1. Individual and team design projects beginning in the sophomore year (Project Lab I & II) must be completed in the automotive engineering area.
2. Students must complete Motorsports Clinic I, II, and III (MEGR 2299, 3355, 3356) in place of Professional Development (ENGR 3295) and Senior Design I & II (MEGR 3255 & 3256).
3. Students must select all three required technical electives from the prescribed list of motorsports engineering courses: MEGR 3210, MEGR 3211, MEGR 4112, MEGR 4143, or MEGR 4144. Other suitable technical electives such as MEGR 3890 may be approved by the Motorsports Engineering Faculty Advisor or Department Chair.

Common Freshman Year

ENGR 1201 Intro to Engineering I	2
CHEM 1251 Chemistry I	3
CHEM 1251L Chemistry I Lab	1
MATH 1241 Calculus I	3
ENGL 1101 English I	3
LBST 1101, 1102, 1103, 1104 or 1105	3
	15

ENGR 1202 Intro to Engineering II	2
PHYS 2101 Physics I	3
PHYS 2101L Physics I Lab	1
MATH 1242 Calculus II	3
ENGL 1102 English II	3
Social Science (Gen Ed)	3
	15

Sophomore Year

PHYS 2102 Physics II	3
PHYS 2102L Physics II Lab	1
MEGR 2141 Engineering Mechanics I	3
MATH 2241 Calculus III	3
ENGL 2116 Intro. To Technical Communications	3
LBST 2101	3

MEGR 2180 Manufacturing Systems	4
MEGR 2156 Design Project Lab I*	2
MEGR 2144 Solid Mechanics	3
MATH 2171 Differential Equations	3
ECGR 2161 Basic Electronic Engineering	3
MEGR 2299 Motorsports Clinic I	1
	16

*Automotive Engineering Area

Junior Year

MEGR 3111 Thermodynamics I	3
MEGR 3121 Dynamic Systems I	3
MEGR 3161 Engineering Materials	3
ECON 1201 or 1202 Economics	3
MEGR 3171 Measurements & Instrumentation	2

MEGR 3171L Instrumentation Laboratory	2 16
MEGR 3112 Thermodynamics II	3
MEGR 3122 Dynamic Systems II	3
MEGR 3116 Heat Transfer	3
MEGR 3156 Design Project Lab II*	2
MEGR 3114 Fluid Mechanics	3
MEGR 3152 Mechanics & Materials Lab	1 15

*Automotive Engineering Area

Senior Year

MEGR 3255 Motorsports Clinic II	2
Motorsports Technical Elective	3
Math Elective	3
LBST 2102	3
MEGR 3221 Machine Analysis & Design	3
MEGR 3251 Thermals/Fluids Lab	1 15

MEGR 3356 Motorsports Clinic III	2
Motorsports Technical Elective	3
Motorsports Technical Elective	3
LBST 2211, 2212, 2213, 2214 or 2215	3
MEGR 3216 Thermal/Fluids Design	3 14

TOTAL HOURS 122