ENGINEERING, COMPUTER SCIENCE,

engineering. The department at Andrews University will assist students in coordinating a program with another engineering school upon request.

Professional Engineering
(First two years)
Suggested courses to be taken during the two years at Andrews**—68**
MATH141, 142, 240, 281, 286; CHEM131,132; PHYS241, 242, 271,272; MECT121; ENGR120, 135, 225, 280; CPTR125 or 151; ENGL115; COMM104; Religion (6 credits); Social Studies and Humanities (3 credits); PE (1 credit).

ENGINEERING TECHNOLOGY

Engineering Technology–the area of the technological employment spectrum between the engineer and the skilled craftsman–includes both the engineering technician (2-year associate degree) and the engineering technologist (Bachelor of Science in Engineering Technology).

Individualized associate degree programs (AT) in engineering technology can be designed for students needing an associate degree.

BSET: Computer Engineering Technology

Major requirements—40
CPTR125 (meets BSET general education requirement), 151, 152, 461; ELCT235, 325, 335, 360; ENGT491, 492; plus 12 credits chosen from upper division CPTR and ELCT courses.

BSET: Mechatronics Engineering Technology

Major requirements—40
MECT122, 285, 355, 415; ELCT235, 307, 355; ENGT491, 492; plus 10 credits chosen from upper division ELCT and MECT courses.

Minor in Engineering Technology—20

CPTR275 **$ (3)**

Computer Organization and Assembler

Covers data representation, number base conversion, representation for integer fractions and floating numbers, Boolean algebra, truth table digital logic and circuit representations of basic computational building blocks, introduction to computer architecture; interrupt schemes; an introduction to system software including assemblers, loaders and linkers, and operating systems. Includes assembly language programming using a macro-assembler. Prerequisite: CPTR152. *Spring*

CPTR295 **(1-3)**

Directed Computer Language Study

Directed study of computer language in consultation with the instructor. Normally, the language is not included in other courses taught by the department. A programming project may be required. Prerequisites: CPTR151 or equivalent.

CPTR416 **✦ $ (3)**

Internet Technologies

A study of current technologies and their effects, including web server software, e-commerce, various scripting languages, human-computer interfacing, perception, and related issues. Prerequisite: CPTR152. *Spring, Summer*

CPTR425 **✦ $ (3)**

Programming Languages

Survey of current programming languages, including structure, runtime systems, the specification of syntax, and semantics. Definition of syntax for formal languages with emphasis on context-free languages. Techniques for scanning and parsing programming languages. Automated grammar analysis parsers. A major programming project is required. Prerequisite: CPTR275. *Fall*

CPTR427 **✦ $ (3)**

Object-Oriented Design and Programming

Emphasizes the study of object-oriented analysis and design methodologies and the application of these to the development of advanced software. Includes survey of object-oriented programming languages and environments. A major programming project is required. Prerequisite: CPTR152. *Fall*

CPTR436 **✦ $ Alt (3)**

Numerical Methods and Analysis

A study of common numerical techniques applicable on the computer. Includes interpolation, extrapolation, approximation techniques, numerical methods for linr 9ming languag. programing langua2.

CPTR536
Compiler Construction
Storage allocation for progra
generation and optimization.
Prerequisites: CPTR275, 425.

CPTR548
Advanced Database Design and Im
Database design and theory. Concurren
integrity, security, query optimization. A s
implementation tradeoffs involved in using va
database packages. Includes a term project and readi
literature. Prerequisite: CPTR275, INFS428. *Fall (*

CPTR550
Network Architecture
A study of the concepts and imple
model of computing. Examines
client/server model. Surveys th
work communications, inclu
associated with thin and thi
IP mediums, UDP/IP and

CPTR555 **(3)**
Advanced Operating S
May include system st rity,
distributed systems, st ese
concepts, and recently reas.
Includes a term projec
Prerequisite: CPTR46

CPTR556 **(3)**
Real Time Systems
A survey of the system
aspects of real time syst
process-control software
from current literature. Pr

CPTR560
Advanced Software Engineeri
A study of applied software proc
including requirement analysis, sys
methodologies, software-project planni
Spring (even years)

Spring (odd years)

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in simple circuits. Weekly: a 3-hour lab. Prerequisite for ELCT141: MATH166, 167. Prerequisite for ELCT142: ELCT141. *Spring (ELCT141), Fall (ELCT142)*

ELCT235 **$ (4)**
Digital Electronics
Binary numbers and codes, Boolean algebra, logic circuits, flipflops and registers, arithmetic circuits, counters, multiplexors, demultiplexors, design of state machines, and comparison of IC logic families. Weekly: a 3-hour lab. Prerequisite: ELCT142. *Spring*

ELCT307 **$ (4)**
Instrumentation and Process Control
Theory and application of electrical transducers and recording devices. Emphasis on signal conditioning in process control applications. Measurement errors and calibration. Weekly: a 3-hour lab. Prerequisite: ELCT235. *Fall*

ELCT325 **$ (3)**
Computing, Network Operations and Maintenance
Techniques and tools of computer and network operation and troubleshooting. Weekly: a 3-hour lab. Prerequisite: ELCT235. *Spring*

ELCT328 **$ Alt (2)**
Printed Circuit Layout
Basic methods of layout and fabrication of single and double layer etched circuit boards. Weekly: a 3-hour lab. Prerequisite: ELCT235. *Spring*

ELCT335 **$ (4)**
Microprocessors
Introduction to computer organization, microprocessors, assembly language programming, memory devices, I/O devices, interfacing with emphasis on control applications. Weekly: a 3-hour lab. Prerequisite: ELCT235 or CPTR275. *Fall*

ELCT350 **$ Alt (2)**
Programmable Logic Controllers
A study of relay logic. Application and programming of industrial programmable controllers to accomplish these relay logic functions. Weekly: a 3-hour lab. Prerequisite: ELCT235. *Spring*

ELCT355 **$ (4)**
Electrical Machinery and Controls
Characteristics and applications of DC motors and generators; transformers, AC motors and generators, motor starters and controls, power factor corrections, and speed controls. Weekly: a 3-hour lab. Prerequisite: ELCT307. *Spring*

ELCT360 **$ (4)**
Communication Systems and Electronics
Filters, oscillators, frequency response plots, tuned circuits, impedance matching, and Fourier series. Amplitude, frequency, phase, and pulse modulation. Weekly: a 3-hour lab. Prerequisite: ENGT310. *Spring*

ELCT365 **Alt (3)**
Transmission Systems
Signal transmission via wire, coaxial cable, waveguide, antenna, and optical fiber media. Attenuation and distortion effects. System power budget. Prerequisite: ELCT360. *Spring*

ELCT380 **$ Alt (4)**
Amplifier and Wave-Shaping Circuits
Linear amplifiers with an emphasis on op-amp circuits and their amplitude and frequency limitations. Includes linear wave-shaping, clipping, clamping, gating, switching, and comparator circuits. Weekly: a 3-hour lab. Prerequisite: ENGT310. *Fall*

ELCT420 **(4)**
Avionics Principles and Systems
A study of operating principles and circuits of communication and navigation equipment used in general aviation. Prerequisites: ELCT335, 360, 380. May not be offered each year. *Fall*

ELCT439 **$ Alt (4)**
Embedded Systems
Microprocessor interfacing and applications in the area of process monitoring and control. Use of BASIC or C++. Weekly: a 3-hour lab. Prerequisite: ELCT335 and CPTR152. *Spring*

ENGINEERING

ENGR120 **(2)**
Introduction to Engineering
Explores specialized areas and job functions of engineers and technologists. A design project emphasizes the engineering design process. Introduces Mathcad. *Fall*

ENGR135 **(1)**
Descriptive Geometry
Solution of basic space problems. Determination of distances and angles, intersections of lines and surfaces, intersections of lines and development of surfaces. Prerequisite: MECT121. *Spring*

ENGR224 **$ (4)**
Engineering Materials
Study of the science of engineering materials. Engineering properties are correlated with internal structure and service environment. Weekly: a 3-hour lab. Prerequisite: CHEM131. *Spring*

ENGR225 **$ (3)**
Circuit Analysis
Resistive circuit analysis, network theorems, dependent sources, energy storage elements, 1st and 2nd order circuit transient responses, ac circuit analysis using phasors and impedances, and ac complex power. Weekly: a 3-hour lab. Prerequisite: MATH142. *Spring*

ENGR248 **(1-4)**
Workshop
Provides flexibility for the occasional workshop where it is appropriate to offer engineering credit. Workshop requirements must be approved by the department.

ENGR280 **(5)**
Engineering Mechanics
Principles of statics and their application to engineering problems; forces, moments, couples, friction, centroids, and moments of inertia. Vectorial kinematics of moving bodies in fixed and moving reference frames. Kinetics of particles, assemblies of particles, and rigid bodies, with emphasis on the concept of momentum. Keplerian motion, elementary vibrations, and conservative dynamic systems. Prerequisite: MATH142. *Fall*

ENGR370 **(2)**
Technical World and Man
Gives students a general understanding of how modern technologies affect society. Topics include how humans respond to technological change, the social consequences of technology, and technological issues in national decisions. *Spring*

ENGR465 **(3)**
Operations Analysis and Modeling
The methodology of mathematical modeling and its relation to solving problems in industrial and public systems. Linear programming, scheduling, queuing, simulation, optimization, and decision analysis. Prerequisites: INDT460, STAT340. May not be offered each year. *Spring*

ENGINEERING MANAGEMENT

ENGM520 **(3)**
Ergonomics and Work Design
The application of ergonomics and engineering principles to the design analysis and measurement of human work systems. *Summer*

ENGM555 **(3)**
Facilities Planning
Planning and design of industrial and service facilities: site selection, process layout, materials handling, and storage. *Summer*

ENGM565 **(3)**
Operations Analysis and Modeling
The development and use of mathematical models to analyze elements of production and service systems: linear programming, probabilistic models, game theory, dynamic programing, queuing theory, and simulation. Prerequisites: INDT460; STAT285; MATH142 or 182. *Spring*

ENGM570 **(3)**
Project Management
Design and management of engineering projects: proposals, planning, resource requirements, organization, scheduling, and cost and schedule control. *Fall*

ENGM690 **(1-4)**
Independent Study
Individual study of research in some area of engineering management under the direction of a member of the engineering faculty.

ENGM698 **(2)**
Research
Research methods and a research project in an area of engineering management.

ENGINEERING TECHNOLOGY

ENGT310 **(3)**
Linear Systems Analysis
Convolution, analysis and spectra of continuous time domain signals, Fourier and Laplace transforms, discrete time domain signals, and the z- transform. Prerequisite: MATH182, ELCT142. *Fall*

ENGT390 **(1-3)**
Independent Study
Individual study, research, or project in some field of engineering technology under the direction of a member of the engineering technology faculty. Prerequisite: permission of person who will direct study.

ENGT395 **(1-4)**
Practicum
Lab or on-the-job experience to build skills in a specific area of engineering technology. Repeatable to 4 credits. Prerequisite: a fundamental course in the area.

ENGT396 **(1-4)**
Cooperative Work Experience
Work experience in industry directed by a faculty member. 120 hours of work is required per credit. A report must be submitted indicating what the student learned. Grade S/U. Repeatable to 4 credits. Prerequisite: Junior/Senior standing.

ENGT475 **(1-4)**
Topics in _____
Repeatable in different subjects (prerequisites depend on topic.)

ENGT491, 492 **(2, 2)**
Senior Design Project I, II
A significant design project which culminates in a working system. Prerequisite: at least one of the following courses: ELCT335, 360; MECT375 or 415. *Fall, Spring*

INDUSTRIAL TECHNOLOGY

INDT310 **(3)**
Industrial Supervision
Introduction to and overview of the fundamentals of industrial supervision. Topics include organization, duties, human relations, training, evaluation, promotion, grievances, management-employee relationships. *Spring*

INDT315 **(3)**
Succeeding in the Workplace
Focus on the development of attitudes, performance, and communication that will assist in making the transition from the classroom to the workplace an enjoyable and profitable experience. *Fall*

INDT320 **(3)**
Work Methods and Measurements
Principles and applications of basic methods and techniques for improvement of the man-job-time relationships; job standards, time and motion studies, and work-space design for efficient use of manpower. *Spring*

INDT410 **(3)**
Project Management
Methodology used successfully to carry out a technical project including proposals, planning, work breakdown, scheduling, creativity, monitoring progress, and documentation. *Fall*

INDT440 **(3)**
Quality Control
Analysis of the factors affecting product quality during manufacturing. Topics include basic statistics, sampling, control charts, measurements methods, inspection systems, reliability, and motivation programs. If this course is taken to fulfill degree requirements at the undergraduate level, it cannot also be taken at the graduate level to fulfill degree requirements for a graduate degree. Prerequisite: STAT285 or 340. *Spring*

INDT450 **(3)**
Industrial Economy
Study of engineering decision methodology and criteria used to include economic factors in determining the best alternative in the design and selection of equipment, structures, methods, and processes. *Spring*

INDT460 **(3)**
Production Planning and Control
Planning and coordination of manufacturing facilities and

materials for economic production: forecasting, estimating, process planning, plant layout, product flow, scheduling, production controls, materials acquisition and handling, and inventory. If this course is taken to fulfill degree requirements at the undergraduate level, it cannot also be taken at the graduate level to fulfill degree requirements for a graduate degree. Prerequisites: MATH166 or equivalent, STAT285 or 340. *Fall*

MECHANICAL TECHNOLOGY

MECT120 **$ (3)**
Computer-Aided Drawing
An introduction to the use of AutoCad, graphics generation and editing, file maintenance, plotting, and 2- and 3-dimensional drawings. Weekly: a 3-hour lab. Credit may not be earned in MECT120 and MECT121. *Fall*

MECT121 **$ (2)**
Mechanical Drawing I
Fundamentals of drawing as applied to mechanical engineering problems. Orthographic projections, auxiliary and sectional views, dimensioning, oblique and isometric views. Sketching and computer-aided drafting. Weekly: a 3-hour lab. *Fall*

MECT122 **$ (3)**
Mechanical Drawing II
Limit dimensioning, drawing, and interpretation of weld symbols. Solid modeling and production drawings using CAD. Weekly: a 3-hour lab. Prerequisite: MECT121. *Spring*

MECT235 **$ (4)**
Materials Technology
Study of industrial materials. Properties of materials correlated with the internal structure. Includes metals, plastics, and ceramics. Weekly: a 3-hour lab. Prerequisites: MATH166, CHEM131. *Spring*

MECT285 **(4)**
Statics and Strength of Materials
Analysis of static force systems. Forces, moments, resultants, free-body diagrams, equilibrium, center of mass, moment of inertia, and friction. Assignments designed to develop problem-solving abilities. Study of internal stress and deformation of elastic bodies. A minimum grade of C required in order to enroll in MECT355. Prerequisite: MATH182. *Fall*

MECT326 **$ Alt (4)**
Fluid Power Systems
Principles and applications of fluid power systems to actuate and/or control machines. Electro-hydraulic-pneumatic systems studied. Principles of fluids introduced. Weekly: a 3-hour lab. Prerequisite: MECT285. *Fall*

MECT355 **(4)**
Dynamics and Kinematics
Fundamentals and applications of dynamics; displacement, velocities, acceleration, work, energy, power impulse, momentum, and impact. Also a study of the basic theories and techniques in the analysis of relative motion, acceleration, and acceleration of machine parts such as linkages, cams, gears, and other mechanisms. Prerequisites: MATH182, MECT285. *Fall*

MECT370 **Alt (4)**
Heat Power
Thermodynamics properties, first and second law of thermo-dynamics, ideal gas law, the Carnot Cycle, power and refrigera-