Public Relations

PREL255 **$ (3)**
Introduction to Public Relations
Basic concepts in public relations, publics, public opinions, attitudes, two-way communications, and evaluation of public relations effectiveness. Basic literature of the field is examined. Basic principles for production of news releases, public service announcements, and other materials are covered.

PREL320 **$ (3)**
Managing PR Campaigns and Special Events
Focuses on preparation for Public Relations careers, media relations, ethics, and industry issues and trends, including literature in the field and professional organizations. Students focus on writing projects, including press kits, proposals, newsletters, brochures, fundraising, speeches, public service announcements, copywriting and create documents for portfolios. Prerequisite: PREL255 and JOUR230 or permission of instructor.

PREL389 **$ (1–3)**
Internship in Public Relations
Students intern at public relations or a related field. At least 90 clock hours per credit of work experience are required. Obtain procedures and guidelines from the department. S/U grade.

PREL454 **♦ $ (3)**
Advanced Public Relations
Examines the characteristics of successful public relations campaigns. Emphasis given to public relations planning and evaluating, as well as to advanced techniques in news publicity, controlled media publicity, and media relations. Professional practitioners are frequent guest lecturers. Prerequisite: PREL255.

PREL460 Alt **$ (3)**
Development
Provides student with an understanding of the facets of development intrinsic to a non-profit organization. Students work on team projects in local agencies and organization. They report to the class, write reflection papers, and give a final oral presentation about their experiences.

PREL465 **♦ $ (3)**
Advanced Topics in Public Relations:_
Study of selected topics in Public Relations. Topic to be announced in advance. Repeatable to 9 credits with different topics. Prerequisite: PREL255.
- *Crisis/Issues Management*
- *Critical Issues in Public Relations*
- *Case Studies in Public Relations*
- *Health Care Communication*
- *Special Events Planning*
- *Public Relations Research Techniques*

PREL510 **(2)**
Advancement and Communication
Developing communication skills necessary to the non-profit arena, including working with volunteers, promoting and positioning various service organizations. Communication with relevant publics.

ENGINEERING & COMPUTER SCIENCE

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Subsequent to publication of the* 2011–2012 Andrews University Bulletin*, the Department of Engineering & Computer Science was moved into the College of Arts & Sciences for the 2011–2012 school year.

Academic Programs	Credits
BS: Computing	40
Emphasis Areas	
Computer Science	
Software Systems	
Minor in Computing	20
BS in Engineering	66
Emphasis Areas	
Electrical and Computer Engineering	
Mechanical Engineering	
Minor in Engineering	20

Undergraduate Programs

Computing

Two emphases are available in Computing—**Computer Science** and **Software Systems**.

Computer Science focuses on a study of computing as well as on its role in an application area. Areas of interest include artificial intelligence, compilers, computer architectures, computer graphics, computer networks, operating systems, program development, and analytical theory. A degree in computing with the Computer Science emphasis prepares students for graduate study, employment in computer systems/ networks, administration/ development, software development/ maintenance, and for careers in education.

Software Systems is an applied study of computing, focusing on the development and maintenance of software in an application area. A minor in an application area is included as part of the degree. Typical minors might include one of the sciences, behavioral science, or business. Supervised "real-world" projects are a requirement for this degree. A degree in Computing with the Software Systems emphasis prepares students for employment in developing and maintaining commercial

applications and for graduate studies in applied computing such as software engineering.

BS: Computing

Degree Requirements

Admission Requirements: Computing foundation courses—MATH191, CPTR151, 152

Progression Requirements: No grade lower than C- may be counted toward any degree requirement. An Engineering or Computing course may be repeated only once. Students may repeat only two Engineering or Computing courses. Students will be asked to withdraw from the program if they fail **two** Engineering or Computing courses in the same semester. Readmission will be considered on an individual basis. Transfer credits need to be submitted a minimum of **six** weeks prior to beginning of classes. Transfer students will be considered on an individual basis. Courses 200-level and above are restricted to admitted majors/minors only.

The major field examination in Computing is part of the senior exit test. All Computing majors are required to have access to their own computers.

Major requirements—40
Common core—22
CPTR151, 152, 276, 440, 460, 491, 492

Computer Science Emphasis
Required courses—9
CPTR425, 437, 467
Major electives—9
Chosen from CPTR courses in consultation with an advisor. A minimum of 9 upper division credits required.
Cognate requirements—26–28
MATH191, 192, 355; STAT340 (14)
ENGR385 (4)
BIOL165; 166 (10)*
or CHEM131, 132 (8)*
or PHYS141, 142 (8)*
or PHYS241, 242, 271, 272 (10)*
* These courses may apply toward the general education life/physical science requirement.

Software Systems Emphasis
Required courses—9
CPTR310, 427, 450
Major electives—9
Chosen from CPTR courses in consultation with an advisor. A minimum of 9 upper division credits required.
Cognate requirements—30–32
MATH191, 355; STAT285 (10)
Minor in an advisor-approved application area (20–22)

Minor in Computing (20)

Required courses—10
CPTR151, 152, 276
Minor electives—10
Chosen from CPTR courses in consultation with an advisor.

Notes: No course grade below a C- may apply to a major or minor in Computing.

Engineering

The Engineering program at Andrews University leads to a Bachelor of Science in Engineering degree with emphases in Electrical and Computer Engineering and in Mechanical Engineering. These two emphases build on a strong traditional mathematics, science, and engineering core. The Electrical and Computer Engineering emphasis focuses on the areas of digital systems, communication systems, and computer controlled instrumentation and computer simulation. The Mechanical Engineering emphasis focuses on mechanical design and the electromechanical elements of smart machines.

The mathematics courses listed as cognates for the Engineering degree satisfy the requirements for a minor in mathematics. A second major in mathematics requires 6 additional credits in mathematics, and a second major in physics requires 14–17 additional credits in physics. See the Mathematics and Physics department listings for details.

BS in Engineering

Admission Requirements: Engineering foundation courses—MATH191, ENGR120, 125, 180, 185; CHEM131. Transfer students will be considered on an individual basis.

Progression Requirements: No grade lower than C- may be counted toward any degree requirement. An Engineering or Computing course may be repeated only once. Students may repeat only two Engineering or Computing courses. Students will be asked to withdraw from the program if they fail **two** Engineering or Computing courses in the same semester. Readmission will be considered on an individual basis. Transfer credits need to be submitted a minimum of **six** weeks prior to beginning of classes. Transfer students will be considered on an individual basis. Courses 200-level and above are restricted to admitted majors/minors only.

General Education Requirements
See professional program requirements, p. 51, and note the following **specific** requirements:
Religion: RELT100, RELT340 and **two more courses** from RELB, RELG, RELT
Language/Communication: ENGL115, 220, COMM104
History: HIST118
Fine Arts/Humanities: professional degree requirements
Life/Physical Sciences: CHEM131
Mathematics: MATH191
Computer Literacy: see major
Service: BHSC100 or ENGR485
Social Sciences: take **one course** from the following: ANTH200, ECON225, GEOG110, PLSC104, PSYC101 or SOCI119
Fitness Education: HLED120 and one additional course from personal fitness, outdoor skills or team activity

Major requirements—66
Common core—30
ENGR120, 125, 180, 185, 225, 275, 285, 310, 450, 491, 492
Cognates—35
MATH191, 192, 215, 240, 286; STAT340
CHEM131
PHYS241, 242, 271, 272

Electrical and Computer Engineering Emphasis
Required courses—31
CPTR151, 152, 465, ENGR325, 335, 385, 415, 435, and 455.
Major electives—5
Chosen from upper division ENGR and CPTR courses in consultation with an advisor.

Mechanical Engineering Emphasis
Required courses—30
CPTR125; ENGR320, 330, 340, 350, 360, 390, 410, 420 and 440.
Major electives—6
Chosen from upper division ENGR courses in consultation with an advisor.

Minor in Engineering (20)

Required courses—11
ENGR120, 125, 185, 225
Minor Electives—9
Chosen from ENGR courses in consultation with an engineering advisor.
Cognates: MATH191, 192

Courses (Credits)

See inside front cover for symbol code.

Computing and Software Engineering

CPTR125 **(3)**
Introduction to Computer Programming
Programming in a selected language. May be repeated for a total of three unique languages. Satisfies general education requirements for computing majors. Only 3 credits of CPTR125 may apply toward a computing major or minor. *Spring*

CPTR151 **(4)**
Computer Science I
An introduction to programming methodology, problem-solving, algorithm development, control structures, arrays, program style, design correctness and documentation techniques, as well as a brief overview of computer systems and computer history. *Fall*

CPTR152 **(3)**
Computer Science II
A continuation of CPTR151 examines program specifications, design, coding, correctness, and style with additional coverage of pointers and arrays, and an in-depth study of recursion and data structures. Includes files, lists, stacks, queues, trees, graphs, and an overview of computer ethics. Prerequisite: CPTR151. *Spring*

CPTR276 **(3)**
Data Structures and Algorithms
A study of techniques for the design and analysis of algorithms using appropriate data structures covered in CPTR152. Topics include: asymptotic complexity bounds, graph and tree algorithms, fundamental algorithmic strategies (such as greedy, divide-and-conquer, backtracking, branch-and-bound, heuristics, pattern matching and string/text algorithms), numerical approximation and dynamic programming. Prerequisite: CPTR152. *Fall*

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.

CPTR310 **(3)**
Database Application Programming
A study of basic database principles and web applications using technologies such as PHP, MySQL, Three Tier Architectures, scripting languages and data manipulation. Manipulating databases using SQL. Sessions, authentication and security. Prerequisite: CPTR151. *Fall*

CPTR416 **♦ Alt (3)**
Internet Technologies
A study of current technologies and their effects, including web server software, e-commerce, various scripting languages, human-computer interaction, perception, and related issues. Prerequisite: CPTR152. *Fall* (even years)

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. Prerequisite: CPTR276. *Spring*

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. Prerequisite: CPTR152. *Spring*

CPTR436 **♦ Alt (3)**
Numerical Methods and Analysis
A study of common numerical techniques applicable on a computer. Includes interpolation, extrapolation, approximation techniques, numerical methods for linear problems, root finding, function fitting, numerical integration, location of extremes, efficiency of numerical algorithms, and minimization of computational error. Prerequisites: CPTR276 and MATH215. *Spring* (odd years)

CPTR437 **♦ (3)**
Formal Theory of Computation
Includes post productions, Turing machines, and recursive functions. Recursive and recursively enumerable sets. Undecidability results of computation. Prerequisites: CPTR152 and MATH355. *Fall*

CPTR440 **♦ Alt (3)**
Operating Systems
Process management, including asynchronous concurrent processes and deadlock, virtual storage management and job and process scheduling, multiprocessing, disk scheduling and file and database systems, performance and security. Prerequisite: CPTR276. *Fall*

CPTR450 **♦ (3)**
Network Computing and Architecture
Concepts applicable to constructing a computer network and the application of computing algorithms and solutions using networked computers and devices. Study topics such as physical transmission media, protocols and associated layers, TCP/IP, application programming interfaces and frameworks, sockets, clustering and security. Prerequisite: CPTR152. *Spring*

CPTR460 **♦ (3)**
Software Engineering
Surveys basic software engineering topics associated with the processes, documents, and products of the entire software life cycle. Topics include software evolution, project organization, and management, feasibility studies, product definition, design, implementation, and testing issues, and the role of the software engineer within the life cycle. Prerequisite: CPTR152. *Fall*

CPTR465 **♦ (3)**
Computer Architecture
Focus on hardware aspects of computing and logical concepts. Includes data representation for numbers and other data types, Boolean algebra, digital logic circuit representations of basic computational building blocks, CPU components, interrupt schemes and buses. Relevance of supporting concepts is discussed, including system software, assemblers, assembly language programming and operating systems. Prerequisite: CPTR152. *Spring*

CPTR467 **♦ (3)**
Database Concepts and Theory
Study of issues relevant to abstract and concrete aspects in both the creation of database management system software and its use. Indexing, buffering and other internal and physical database design issues. Relational model algebra, calculus and query languages. Functional dependencies and normalization. Study of and modeling using Entity-Relationship and other relevant paradigms. Common application databases. Introduction to the use of transactions, query optimization and non-relational database models. Design and programming assignments using databases. Prerequisite: CPTR152. *Spring*

CPTR475 **(1–4)**
Topics in _____
Selected topics of current interest in computing such as Robotics, advanced languages, or others. Repeatable with different subjects.

CPTR485 **♦ (3)**
Computer Graphics
Introduction to computer graphics focusing on the algorithms and data structures for the modeling and shading of 3-d images. Topics include basic OpenGL programming, mesh generation, shading, raytracing, radiosity methods, procedural textures, and fractal methods. Prerequisites: CPTR 152. *Fall*

CPTR487 **♦ Alt (3)**
Artificial Intelligence
Provides the conceptual basis for understanding current trends in Artificial Intelligence. Topics include both symbolic and numeric processing, intelligent search methods, problem representation, machine learning, expert systems, and a survey of some social implications of AI. Prerequisite: CPTR152. *Fall* (odd years)

CPTR491 **(3)**
Computing Capstone I
The first of a capstone project sequence required for all senior computing majors. Software engineering and its methodologies are applied. Various software life cycle models are incorporated. Students are placed into teams and assigned to a client and/or project. The teams create a project plan, analyze and specify requirements for their project and develop a design. Prototype demonstrations and periodic oral and written progress reports are required to help assure steady progress. Individuals and teams produce a variety of documents throughout the course. Documents include a management plan, project abstracts, a requirements specification, a user interface prototype document, and a design document consisting of architectural and detailed design elements. This course is a writing-intensive course. Prerequisite: CPTR460

CPTR492 **♦ (3)**
Computing Capstone II
The second of a capstone project sequence required for all computing majors. Students are placed into teams and assigned to complete an existing project for a client. The teams implement and debug code according to a design produced earlier. They produce a testing plan, carry out testing, record test results and summarize them. Prototype demonstrations and periodic progress reports are required to help assure steady progress. Individuals and teams produce a variety of documents throughout the course. These documents include a testing plan, a testing log, and a summary of testing, a maintenance manual and a user manual. Teams also deliver a public demonstration at the end of the course, as well as a final presentation. Prerequisite: CPTR491.

CPTR495 **(1–3)**
Independent Study
Directed study of material of special interest chosen in consultation with the instructor. No more than 6 credits may be earned in CPTR495. Graded S/U.

CPTR496 **(1–3)**
Special Projects
Project chosen in consultation with instructor. No more than 6 credits may be earned in CPTR495. Graded S/U.

CPTR548 **Alt (3)**
Advanced Database Systems
Database design and theory. Concurrency, distributed databases, integrity, security, query optimization, transaction processing, object-oriented databases. A survey of the design and implementation tradeoffs considered for these topics in the creation of available database packages. Includes a term project and reading from the literature. Prerequisite: CPTR467 or equivalent. *Spring*

CPTR557 **Alt (3)**
Advanced Network Computing and Architecture
A study of the concepts, conceptual design and implementation of the client/server, multi-tier and distributed models of computing. Consider topics such as physical media, protocols and layers, application programming interfaces, clustering, distributed computing and security from the perspective of a programmer using these tools as well as a system programmer and architect that creates and implements such tools, algorithms and models. Prerequisite: CPTR450 or equivalent. *Fall*

CPTR568 **Alt (3)**
Advanced Computer Architecture
Functional analysis of computer hardware and supporting software systems. Includes a comparative study of past, present and proposed architectures as well as computer performance analysis and optimization. Additional topics may include parallel architectures and detailed CPU design issues. Prerequisite: CPTR465 or equivalent. *Fall*

CPTR637 **Alt (3)**
Formal Methods
A survey of the different paradigms associated with formal methods. Applies formal methods to the specification, verification, and validation of software systems. Case studies are examined and a programming project is included. Prerequisites: CPTR460, MATH215, STAT285. *Fall*

CPTR660 **(0)**
Thesis/Project Extension

CPTR689 **(1–4)**
Topics in _____
Topics in computing such as graphics, parallel processors, compiler design and optimization, communications and signal processing, distributed systems, graph theory, artificial intelligence, and formal theory. Repeatable with different topics to 6 credits. Prerequisite: Depends upon topic.

CPTR690 **(1–4)**
Independent Study
Directed study of material of special interest chosen in consultation with the instructor. May be repeated to 6 credits. Grade S/U.

CPTR698 **(1–4)**
Master's Research Project
Special project chosen in consultation with student's advisor and instructor. To be repeated to 6 credits. Grade S/U.

CPTR699 **(1–6)**
Master's Thesis
To be repeated to 6 credits. Graded S/U.

Engineering

ENGR120 **$ (2)**
Introduction to Engineering & Design
An introductory course in engineering and design. It teaches the basic principles of design and related design tools from a basic level. Students will be taught to use computer tools for engineering analysis. *Fall*

ENGR125 **$ (3)**
Engineering Graphics
Fundamentals of drawing as applied to mechanical engineering problems. Orthographic projections, auxiliary and sectional views, dimensioning and tolerancing, oblique and isometric views, detail and assembly drawing. Sketching and computer-aided drafting. Weekly: Two 1-hour lectures and two 1.5-hour labs. *Fall*

ENGR180 **$ (4)**
Materials Science
Introduction to the study of materials. Covers physical properties, application and relevant properties associated with engineering material. A weekly hands-on laboratory helps demonstrate the relationship of properties of materials studied in lecture. Weekly: 3 hours lecture and a 3-hour lab. Prerequisite: CHEM131. *Spring*

ENGR185 **(3)**
Engineering Statics
Principles of statics and their application to engineering problems; forces, moments, couples, friction, centroids and moments of inertia. Prerequisite or Corequisite: MATH191. *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: 2 hours lecture and a 3-hour lab. Prerequisite MATH191. Corequisite or prerequisite MATH192. *Fall*

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.

ENGR275 **$ (3)**
Electronics I
Introduction to diodes and transistors and their applications in switching and amplification circuits. Introduction to the basic op-amp circuits and their characteristics. Binary numbers and codes, Boolean algebra, logic circuits, flip-flops and registers. Digital circuit applications. Weekly: 2 hours lecture and a 3-hour lab. Prerequisite: ENGR225. *Spring*

ENGR285 **(3)**
Engineering Dynamics
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. Prerequisites: ENGR185 and MATH192. *Spring*

ENGR310 **(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. Prerequisites: MATH215, 286. Corequisite: CPTR125. *Spring*

ENGR320 **(3)**
Manufacturing Processes
Deals with today's technologies and the future of manufacturing. It includes details of product design process, rapid prototyping and a survey of manufacturing technologies. Prerequisite: ENGR180. *Fall*

ENGR325 **$ (4)**
Electronics II
Modeling of transistors, biasing of transistors in amplifier circuits, and amplitude and frequency limitations of transistors. Linear and switching electronic circuits with an emphasis on op-amps. Weekly: 3 hours lecture and a 3-hour lab. Prerequisite: ENGR275. *Fall*

ENGR330 **(3)**
Thermodynamics
Introduction to the nature of energy and study of energy transport conservation in closed and flowing systems; properties and states of solids, liquids, vapors, and gases; enthalpy; meaning and production of entropy and introduction to cyclic systems. Prerequisite: PHYS242. *Fall*

ENGR335 **(3)**
Logic Circuit Design
Modern digital logic families, state machines, design of digital logic circuits in FPGAs, and VHDL specification of logic circuits. Prerequisite: ENGR275. *Fall*

ENGR340 **(3)**
Mechanics of Materials
Study of stresses and strain, deformations and deflections of posts, shafts, beams, columns; combined stresses; elasticity. Prerequisite: ENGR185. *Fall*

ENGR350 **$ (3)**
Sensors and Actuators
Study of temperature, mechanical, and optical sensors; sensor signal conditioning; ac, dc, and stepping motors; and the motor control requirements. Weekly: 2 lectures and a 3-hour lab. Prerequisite: ENGR275. *Spring*

ENGR360 **(3)**
Fluid Dynamics
Fluid statics and dynamics of fluid motion. Conservation of mass, momentum, and energy in laminar and turbulent flow. Boundary layer flow, lift and drag forces, viscous flow in conduits, open channel flow, flow measurements. Prerequisites: ENGR285, 330, MATH286. *Spring*

ENGR380 **$ (2)**
Programmable Controllers
Introduction to typical programmable logic controllers and their applications. Emphasis on programming and interfacing to electromechanical systems. Weekly: 1-hour lecture and a 3-hour lab. Prerequisite: ENGR275. *Spring*

ENGR385 **$ (4)**
Microprocessor Systems
Introduction to computer organization, microprocessors, assembly language programming, memory devices, I/O devices, interfacing with emphasis on control applications. Weekly: 3 hours lecture and a 3-hour lab. Prerequisite: ENGR335 or CPTR276. *Spring*

ENGR390 **$ (2)**
Engineering Measurements Lab
Introduction to various measurement techniques available for mechanical and general engineering application. National Instrument LabView Data Acquisition System is used to collect data for analysis. Weekly: Two 3-hour labs. Prerequisites: ENGR330, 340. *Spring*

ENGR410 **$ (4)**
Feedback Control Systems
Study of both analog and digital feedback control systems. Performance criteria and design and analysis methods. Weekly: 3 hours lecture and a 3-hour lab. Prerequisites: ENGR275, 285, and 310. *Fall*

ENGR415 **(3)**
Virtual Instrumentation
For engineering majors. Introduction to virtual instrumentation with emphasis on the sampling requirements and the signal conditioning requirements. Data logging and control applications. Prerequisite: ENGR275 and CPTR125 or 151. *Fall*

ENGR415-02 **(1)**
Virtual Instrumentation
Introduction to virtual instrumentation with emphasis on the sampling requirements and the signal conditioning requirements. Data logging and control applications. *Fall*

ENGR420 **(3)**
Machine Design
This course emphasizes both failure theory and analysis as well as the synthesis and design aspect of machine elements. It touches on the commonality of the analytical approaches needed to design a wide variety of elements and the need to use computer aided engineering as an approach to the design and analysis of these classes of problems. Prerequisites: ENGR320, 390. *Fall*

ENGR425 **(3)**
Project Management
Methodology used successfully to carry out a technical project including proposals, planning, work breakdown, scheduling, creativity, monitoring progress, and documentation. Prerequisite: STAT285 or 340. *Fall*

ENGR430 **(3)**
Quality Control
Analysis of the factors affecting product quality during manufacturing. Topics include use of basic statistics and probability for measurements, observations, sampling, control charts and reliability. Prerequisite: STAT285 or 340. *Spring*

ENGR435 **(3)**
Electromagnetic Fields
Study of static and dynamic electric and magnetic fields. Unbounded and bounded fields, fields in materials, force and torque, energy and potential functions, and Faraday induction. Propagation of electromagnetic energy; plane waves, transmission lines, and waveguides; radiation from dipole antennas; introduction to arrays. Prerequisites: MATH240, 286, PHYS242. *Fall*

ENGR440 **(3)**
Heat and Mass Transfer
Study of steady-state and transient heat conduction, forced and non-forced convection through ducts and over surfaces, black-body thermal radiation, solar radiation, heat exchangers, and mass transfer. Prerequisites: ENGR360, MATH286. *Spring*

ENGR450 **(2)**
Engineering 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. Prerequisites: MATH145 or MATH191. *Fall*

ENGR455 **$ (4)**
Communication Systems
Introduction to analog and digital communication systems; including topics in modulation; baseband and bandpass signals;

power spectral density and bandwidth; random processes; noise, signal-to-noise ratio, and error probability; and system performance. Prerequisites: ENGR310, 325, STAT340. *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: MATH192, STAT340. May not be offered each year. *Spring*

ENGR470 **(3)**
Finite Element Methods
Introduction of finite element methods for the solution of problems in solid mechanics and heat transfer. Techniques for obtaining approximate numerical solutions to governing differential equations in the problem areas are covered. Industrial software is applied to the analysis and design of a broad range of engineering problems. Prerequisites: ENGR330, 340, MATH286. *Fall*

ENGR475 **(1–4)**
Topics in __
Repeatable in different subjects (prerequisites depend on topic).

ENGR485 **(2–6)**
Community Project in Engineering
"Hands-on" involvement in humanitarian and/or service-oriented projects. Work initiated by students requires prior approval of faculty. Letter grade or graded on S/U basis. May be repeated for up to 6 credits.

ENGR491 **(1)**
Review of Engineering Design
Selection, proposal and planning of capstone project. *Fall*

ENGR492 **$ (3)**
Senior Design Project
A significant design project which culminates in a working system, component, process or a complete description of a proposed design. Both an oral and written presentation of the results of the project are required. Prerequisite: ENGR385 or 390. *Spring*

ENGR495 **(1–3)**
Independent Study
Individual study, research, or project in some field of engineering under the direction of a member of the engineering faculty. Prerequisite: permission of the person who will direct the study.

ENGR496 **(1–4)**
Cooperative Work Experience
Work experience in industry directed by an engineering faculty member. 120 hours of work is required per credit. A report must be submitted that summarizes the work experience and indicates the value of the experience to the student. Grade S/U. Repeatable to 4 credits. Prerequisite: junior/senior standing and permission of the person who will direct the study.

ENGLISH

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Emeriti
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Academic Programs	Credits
BA: English	42
English Education Emphasis	
Literature Emphasis	
Writing Emphasis	
Minor in English	21
Minor in Teaching English to Speakers of Other Languages	21
MA: English	33
General	
Teaching English to Speakers of Other Languages	

Mission
The Andrews University Department of English constitutes a vital component of this distinctive Seventh-day Adventist institution of higher learning. It draws together a diverse community of learners committed to seeking knowledge, affirming faith, and changing the world. Within the framework of Christian faith and purpose, it develops graduates who are competent, creative and critical readers, writers and thinkers, capable of a variety of careers and scholarly pursuits.

English Proficiency Standards
Students whose first language is not English must meet certain English-language proficiency standards before they are accepted into any program in the Department of English. To qualify for admission, students must have passed one of the language