

**VDEO210** **\$ (3)**

***Digital Video Editing***

An introductory class covering the fundamental techniques and concepts of nonlinear editing. Students explore the process of video editing from conceptualization to final output. Emphasis on sequencing and continuity, use of visual effects, color correction, audio editing, media management, narration and industry terminology. Lab required. Prerequisites: DGME175, VDEO130. *Fall, Spring*

**VDEO320** **\$ (3)**

***Video Compositing***

An introductory course covering the essential components in video compositing. Students learn how to create innovative visual effects and motion graphics for video. Emphasis on text animation, keyframing, masks, alpha channels, 3-D compositing, rendering, application integration, advanced visual and artistic effects. Lab required. Prerequisites: DGME215; VDEO210. *Spring*

**VDEO340** **\$ (3)**

***Video Shooting***

An advanced study in digital video, exploring professional level cameras, lighting, sound and other equipment necessary to make good video, aesthetic issues of creating visual and audio stories, and developing skills and knowledge beyond an introductory level. Lab required. Prerequisites: ART214; JOUR230; VDEO130, 210. *Spring*

**VDEO360** **\$ (4)**

***3-D Imaging***

A study of basic 3-D modeling principles and techniques. Students learn 3-D modeling terminology and how to create 3-dimensional models using polygonal, nurbs, and subdivision techniques. Students also learn basic lighting and surfacing. Lab required. Prerequisites: ART104; DGME175. *Fall*

**VDEO370** **\$ (4)**

***3-D Animation***

A study of 3-D animation techniques implementing key frame, forward and inverse kinematics, dynamics, lighting, paint effects, rendering and more. Lab required. Prerequisites: DGME215; VDEO210, 360. *Spring*

**VDEO390** **\$ (3)**

***DVD Authoring/Design***

A course emphasizing production of interactive DVD- Video, DVD authoring, work flow, story boarding, navigation, menu design, bit budgeting, video and audio encoding, DVD video navigational structures, web linking, proofing, pre-mastering, and recording to DVD-R. Lab required. Prerequisite: DGME347. *Spring*

**VDEO465** **\$ (3)**

***Video Documentary***

Study and application of documentary storytelling techniques. Students will explore the technical and creative use of digital video cameras in documentary filmmaking. Emphasis on interview techniques, story selection and structure. One lationtudy7.808ing

**BS: Computing****Major requirements—40****Common core—19**

CPTR151, 152, 276, 427, 440, 460

**Computer Science Emphasis****Required courses—9**

CPTR425, 436 or 437, 467

**Major electives—12**

Chosen from CPTR courses in consultation with an advisor.

A minimum of 12 upper division credits required.

**Cognate requirements—26–28**

MATH141, 142, 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 natural science requirement

**Software Systems Emphasis****Required courses—9**

CPTR310, 450, 466

**Major electives—12**

Chosen from CPTR courses in consultation with an advisor.

A minimum of 12 upper division credits required.

**Cognate requirements—36–38**

MATH182, 355; STAT340 (9)

Minor in an advisor-approved application area (20-22)

**Minor in Computing—20****Required courses—12**

CPTR125, 151, 152, 276

**Minor electives—8**

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.

A minimum GPA of 2.25 may apply to a major or minor in Computing.

A secondary-education endorsement is available for students seeking either a major or minor in Computing. In such cases, CPTR459 must be taken. Consult the School of Education for further information.

**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****Major requirements—66****Common core—30**

ENGR120, 125, 180, 185, 225, 275, 285, 310, 491, 492, and INDT450.

**Cognates—35**

MATH141, 142, 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 and INDT courses in consultation with an advisor.

**Minor in Engineering—20****Required courses—10**

ENGR120, 125, 185, 225

**Minor Electives—10**

Chosen from ENGR and INDT courses in consultation with an engineering advisor.

**Cognates:** MATH182 or MATH141, 142**Graduate Programs****MS: Software Engineering**

Software Engineering is an applied study of computing focusing on the software development process through the application and synthesis of principles from computer science and related fields. Emphasis is placed on practical results balanced by scientific foundation. Supervised “real-world” projects are a requirement for this degree.

**Admission requirements.** In addition to meeting the general graduate admission requirements on pp. 46–48 of the bulletin, students applying for admission to the MS: Software Engineering program must show evidence that they have taken academic course work and/or demonstrate proficiency in the following areas:

- Calculus
- Computer Organization and Assembler
- Discrete Mathematics
- Elementary Data Structures
- Probability or Statistics
- Programming proficiency in two computer languages (including C or C++)

**Degree requirements—32**

A minimum of 32 semester credits. At least 23 credits chosen from 500- and 600-level graduate courses. The Comprehensive Examination must be successfully completed prior to graduation. Completion of the following requirements:



**CPTR459**

Alt (2)

***Secondary Methods: Computer Science***

Considers computer science programs in the secondary school and presents information and materials for teaching computer science in secondary school. Topics include organization and maintenance of equipment, publications, legal issues, dealing with diversity of abilities, problem-solving skills, and strategies for debugging programs. Prerequisite: CPTR276.

**CPTR460**

ologies, software-project planning models (e.g., COCOMO), implementation, testing and reuse, language, tool and hardware selection, software economics, productivity measurement, risk management, statistical process evaluation, and control.  
Prerequisites: CPTR460, MATH182 or 141, STAT285. *Spring*

**CPTR561, 562 (2, 3)**

***Software Engineering Group Project I, II***

The implementation of a group project and the study of topics related to the group project including CASE tools, 4GL's, graphical user interfaces. Generally, the project begun in CPTR561 carries over to CPTR562. Corequisites: CPTR460, 560 respectively. *Fall, Spring*

**CPTR568 (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*

**CPTR585 Alt (3)**

***Advanced Computer Graphics***

Advanced topics and current research in computer imaging—may include shading, ray tracing, radiosity, color spaces, lighting models, texture mapping, and recently published research in computer imagery. Includes term project and readings from the literature. Prerequisite: CPTR485. *Spring* (even years)

**CPTR587 Alt (3)**

***Advanced Artificial Intelligence***

Provides a forum for exploring current topics in machine intelligence through a survey of recent research results, independent readings, and hands-on projects. Typical topics include machine vision, speech recognition, natural language processing, and machine learning systems. Prerequisite: CPTR487. *Spring* (odd years)

**CPTR625 Alt (3)**

***Analysis of Algorithms***

Technique for analyzing and designing algorithms, including average/worst case analysis, asymptotics, recurrences, empirical experimentation, intractability proofs (i.e., NP-Completeness) and heuristic alternatives. Application of such techniques as divide-and-conquer, graph, greedy, dynamic programming, backtracking, branch-and-bound, and probabilistic algorithms. Prerequisites: CPTR152, MATH315, 355, STAT340.

**CPTR637 (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. *Spring*

**CPTR660 (0)**

***Thesis/Project Extension***

**CPTR689 (1-4)**

***Topics in \_\_\_\_\_***

Topics in computer science 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***

Introduces students to the engineering profession. Various engineering disciplines, job functions, engineering designs and engineering ethics will be discussed. Tips on how to succeed in the classroom, advice on how to gain actual, hands-on experience will be discussed. Introduces computer tools such as Mathcad and Microsoft Excel. *Fall*

**ENGR125 (2)**

***Engineering Graphics***

tionr too-aiS/U.ingftled8.1(T)35W1(A)1leekly:fTlchoure a prog3-hour labTJ/TT3



Unbounded and bounded fields, fields in materials, force and

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. Prerequisite: MATH165 or MATH141. *Fall*

**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.