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, sci-
ence, and engineering core. The Electrical and Computer Engineering
emphasis focuses on the areas of digital systems, communication sys-
tems, and computer controlled instrumentation and computer simula-
tion. The Mechanical Engineering emphasis focuses on mechani-
cal 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 sec-
ond major in mathematics requires 6 additional credits in mathe-
matics, 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, assymptotics, 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

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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.