

Holsinger, Donald (1997) BA, Brigham Young U., 1966; MA, MS, U. of Wisconsin, 1967, 1969; PhD, Stanford U., 1972.  
 Randall, E. Vance (1992) BS, MEd, Brigham Young U., 1975, 1978; PhD, Cornell U., 1989.

#### Associate Professors

Baugh, Steven C. (2000) BS, MEd, EdD, Brigham Young U., 1969, 1970, 1978.  
 Ferrin, Scott Ellis (1997) BA, JD, Brigham Young U., 1980, 1984; MEd, EdD, Harvard U., 1989, 1996.  
 Hallam, Pamela (2006) BS, MA, Brigham Young U., 1979, 1990; EdD, U. of Utah, 2006.  
 Hilton, Sterling C. (1996) BA, MA, MS, Brigham Young U., 1987, 1990; PhD, John Hopkins U., 1996.  
 Hite, Julie M. (2000) BS, MOB, Brigham Young U., 1980, 1995; PhD, U. of Utah, 1999.  
 Matthews, L. Joseph (1998) BA, U. of Wyoming, 1972; MEd, EdD, Brigham Young U., 1978, 1987.  
 Mayes, Clifford T. (1998) BA, MA, U. of Arizona, 1974, 1981; MA, U. of Oregon, 1979; PhD, U. of Utah, 1997.  
 Richards, A. LeGrand (1985) BS, PhD, Brigham Young U., 1975, 1982; MEd, Harvard U., 1976.  
 Williams, Ellen J. (2000) BA, MEd, Utah State U., 1966, 1973; EdD, Brigham Young U., 1990.

#### Assistant Professor

Peterson, Erlend D. (1966) BS, MS, EdD, Brigham Young U., 1967, 1971, 1985.

#### Adjunct Faculty

Poulsen, Denis (1998) BS, MEd, Brigham Young U., 1967, 1979.  
 Van Orman, Jan (1999) BA, MA, U. of Utah, 1964, 1970.

#### Emeriti

Andersen, Dan W. (1980) BS, U. of Utah, 1952; MS, U. of Southern California, 1955; PhD, U. of Wisconsin, Madison, 1961.  
 Butterfield, Dennie D. (1974) BA, Brigham Young U., 1955; MA, Fresno State Coll., 1962; EdD, U. of California, Los Angeles, 1972.  
 Christensen, Dean C. (1957) BS, MS, Utah State U., 1938, 1948; EdD, U. of Oregon, 1957.  
 Flinders, Neil J. (1978) BS, MRE, EdD, Brigham Young U., 1960, 1963, 1968.  
 Garfield, Rulon Roy (1978) BS, MA, PhD, U. of Utah, 1954, 1956, 1964.  
 Harms, Callis R. (1960) BS, MEd, Brigham Young U., 1952, 1956; EdD, Arizona State U., 1961.  
 Heaton, Israel C. (1956) BS, MS, Utah State U., 1940, 1941; EdD, DRE, Indiana U., Bloomington, 1955.  
 Hungerford, Curtiss R. (1977) BA, Stanford U.; MA, PhD, U. of Southern California, 1956, 1967.  
 Hyatt, Norman F. (1970) BS, MS, Brigham Young U., 1948, 1949; EdD, U. of Oregon, 1964.  
 Patterson, Robert S. (1992) BEd, MEd, U. of Alberta, Canada; PhD, Michigan State U., 1968.  
 Shute, R. Wayne (1974) BS, MEd, Brigham Young U., 1955, 1959; EdD, U. of Southern California, 1964.  
 Van Alfen, Curtis N. (1967) BS, MS, Utah State U., 1957, 1959; EdD, U. of Utah, 1967.  
 Webb, Clark D. (1966) BA, MA, Brigham Young U., 1964, 1966; PhD, U. of Texas, Austin, 1970.  
 Willardson, J. D. (1996) BS, Brigham Young U., 1966; MBA, U. of Utah, 1979; EdD, U. of Southern California, 1987.

## Electrical and Computer Engineering

Michael Jensen, Chair  
 459 CB, (801) 422-4012

Janalyn Mergist, Undergraduate Major Advisor  
 459 CB (801) 422-4012

Ira A. Fulton College of Engineering and Technology Advisement Center  
 264 CB, (801) 422-4325

### Admission to Degree Program

The degree programs in the Department of Electrical and Computer Engineering carry special enrollment limitations. Please see the department or college advisement center for specific details.

### The Discipline

Electrical and computer engineers study phenomena, devices, and systems for information processing, communication, and systems control. These studies, grounded primarily in physics and mathematics, have enabled engineers to develop the innovative new technologies for information acquisition, processing, storage, and communication that have made possible our contemporary Age of Information.

Examples of systems developed by electrical and computer engineers include radio, television, radar, satellite communication systems, cellular telephones, laptop computers, fiber-optic communications devices, global and local computer networks, robotic systems, control systems, fax machines, medical image processing, computer modems, lasers, pagers, computer vision, programmable calculators, VLSI chips, computer-aided design tools, and medical instruments.

Although it is the goal of engineering to produce useful objects, electrical and computer engineers typically play a limited role in construction, assembly, or mass production. Instead, they focus on design, analysis, and the development of the underlying theory and knowledge applied in the design process.

Many engineers are involved in designing and developing products, but other electrical and computer engineers may choose to work in product marketing, project management, system calibration and maintenance, product testing, or other areas related to electronic systems.

Computer programming skills and the ability to use advanced design and simulation software packages are vital in electrical as well as computer engineering. As part of their training, electrical engineers become familiar with a variety of programming languages and software environments. This experience is closely coupled to real-world applications.

### Career Opportunities

Electrical and computer engineers are among the most actively recruited students graduating from a four-year program. Baccalaureate engineers typically start their careers as members of project teams with one or more of the following responsibilities: designing digital, analog, or opto-electronic circuits; creating or testing application-specific software; testing components or systems; or providing technical support for sales. Later on, many engineers find themselves pursuing managerial careers, starting their own companies, or even managing entrepreneurial funds. Top graduates are also well received by medical schools, law schools, and professional and management programs.

The BS curriculum for both the electrical engineering and computer engineering degrees is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET).

## Graduation Requirements

To receive a BYU bachelor's degree a student must complete, in addition to all requirements for a specific major, the following university requirements:

- The university core, consisting of requirements in general and religious education (See the University Core section of this catalog for details. For a complete listing of courses that meet university core requirements, see the current class schedule.)
- A minimum of 30 credit hours in residence
- A minimum of 120 credit hours
- A cumulative GPA of at least 2.0

## Undergraduate Programs and Degrees

BS Computer Engineering  
BS Electrical Engineering

Students should see their college advisement center or department advisor for help or information concerning the undergraduate programs.

## Graduate Programs and Degrees

MS Electrical and Computer Engineering  
PhD Electrical and Computer Engineering

For more information see the BYU 2007–2008 Graduate Catalog.

## General Information

**Preprofessional Program.** All students who declare electrical and computer engineering as a major will be designated preprofessional until they submit an application for acceptance to the professional program (available at the college advisement center, 264 CB) and it has been approved by the department's admissions committee. Preprofessional courses must be completed with a B average GPA. Preprofessional students are not allowed to enroll in electrical and computer engineering professional courses.

The status of students who do not enroll in EC En 212 in the semester in which they are admitted or who do not receive a grade of C– or better in EC En 212 reverts to preprofessional. To continue in the program, a student must reapply to the professional program, be reaccepted, and then retake EC En 212. We encourage such students to seek advisement in planning their course schedules, and to discuss ways to better prepare themselves to be successful when retaking EC En 212.

**Academic Standards and Continuance.** On gaining acceptance into the professional program, students must maintain a minimum university cumulative grade point average of 2.0. Students are required to pass prerequisite courses in the major with a grade of C– or better before taking follow-on courses.

**Professional Registration.** The Electrical and Computer Engineering Department provides the option for graduates to become registered professional engineers. General qualifications for becoming registered are explained in the Ira A. Fulton College of Engineering and Technology section of this catalog. This status is vital to engineering practice in the public sector and to much consulting work. The basic electrical and computer engineering program outlined in this department prepares graduates to successfully complete the Fundamentals of Engineering (FE) examination. Students who wish to become registered as professional engineers are advised to discuss this matter with an advisor from the department soon after admission to the professional program.

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## BS Computer Engineering (91.5–92.5 hours\*)

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*This is a limited-enrollment program requiring departmental admissions approval. Please see the college advisement center or the department advisor for information regarding requirements for admission to this major.*

### Program Objectives

1. Provide instruction in computer engineering by introducing students to the analytical thinking, language, and skills associated with the discipline.
2. Sustain an excellent, nationally recognized, and accredited undergraduate program that prepares graduates to compete with the best in the field; obtain industry employment, engage in technology-based entrepreneurship, or complete further study in postgraduate programs; make fundamental contributions to science and technology; serve in responsible positions of technical leadership; and be examples of faith, character, lifelong learning, service to the community, and high professional ethics as set out in the document Aims of a BYU Education.
3. Provide opportunities to engage in scholarly research or creative design that complement the education obtained through the course work by including design laboratories, a major design experience, and, where practical, participation in funded research projects.
4. Seek and retain faculty who are examples of faith, intellect, and character who instill in students the skills and the desire to continue learning and to serve others throughout their lives.

### Major Requirements

1. Complete the following preprofessional program as soon as possible upon entering BYU:
  - a. Complete the following (or approved equivalent courses):  
Math 112, 113.  
Phscs 121, 220.
  - b. During the semester of completing the above, obtain an application from the college advisement center and apply for professional status. (Contact the department or the college advisement center for additional details.)
2. Complete the following supporting courses (either as a preprofessional or a professional student):  
Chem 105 or 111.  
C S 142, 235, 236, 240.  
EC En 124, 224.  
Engl 312 or 316.  
Math 334, 343.
3. Complete the following professional requirements:  
EC En 212, 313, 317, 320, 324, 370, 380, 391, 490.
4. Complete at least 19 hours from the following advanced program and technical electives:
  - a. Complete at least two of the following courses:  
EC En 425, 427, 451.
  - b. Complete one of the following options:  
**Either** EC En 362  
**Or** EC En 360, 361.
  - c. Complete remaining course hours from the following:
    - (1) Additional courses listed in item 4a above or other 400-level electrical and computer engineering courses.
    - (2) C S 345, 428, 431, 452, 455, 456, 460, 462, 465, 470, 478, 486.
    - (3) 500-level computer science courses.

**Note:** Contact the Electrical and Computer Engineering Department for current information about added and/or deleted courses, as well as information about when courses are offered.

\*Hours include courses that may fulfill university core requirements.

## BS Electrical Engineering (90.5–91.5 hours\*)

*This is a limited-enrollment program requiring departmental admissions approval. Please see the college advisement center or the department office for information regarding requirements for admission to this major.*

### Program Objectives

1. Provide instruction in electrical engineering by introducing students to the analytical thinking, language, and skills associated with the discipline.
2. Sustain an excellent, nationally recognized, and accredited undergraduate program that prepares graduates to compete with the best in the field; obtain industry employment, engage in technology-based entrepreneurship, or complete further study in postgraduate programs; make fundamental contributions to science and technology; serve in responsible positions of technical leadership; and be examples of faith, character, lifelong learning, service to the community, and high professional ethics as set out in the document Aims of a BYU Education.
3. Provide opportunities to engage in scholarly research or creative design that complement the education obtained through the course work by including design laboratories, a major design experience, and, where practical, participation in funded research projects.
4. Seek and retain faculty who are examples of faith, intellect, and character who instill in students the skills and the desire to continue learning and to serve others throughout their lives.

### Major Requirements

1. Complete the following preprofessional program as soon as possible upon entering BYU:
  - a. Complete the following (or approved equivalent courses):  
Math 112, 113.  
Phscs 121, 220.
  - b. During the semester of completing the above, obtain an application from the college advisement center and apply for professional status. (Contact the department or the college advisement center for additional details.)
2. Complete the following supporting courses (either as a preprofessional or a professional student):  
Chem 105 or 111.  
C S 142, 235.  
EC En 124, 224.  
Engl 312 or 316.  
Math 214, 334, 343.  
Phscs 281.
3. Complete the following professional requirements:  
EC En 212, 313, 317, 360, 361, 370, 380, 391, 490.
4. Complete at least 19 hours from the following advanced program and technical electives:
  - a. Complete four courses from the following:  
Ch En 381.  
EC En 320, 324, 425, 427, 443, 445, 450, 451, 464, 466, 483, 485, 487.
  - b. Complete remaining course hours selected from the following:
    - (1) Additional courses listed in item 4a above, or other 400-level electrical and computer engineering courses.
    - (2) 500-level electrical and computer engineering courses.
    - (3) Other engineering, mathematics, physics, or computer science courses as specified or approved by the Electrical and Computer Engineering Department.

**Note:** Contact the Electrical and Computer Engineering Department for current information about added and/or deleted courses, as well as information about when courses are offered.

\*Hours include courses that may fulfill university core requirements.

## Electrical and Computer Engineering (EC En)

### Undergraduate Courses

**124. (EC En-C S) Introduction to Computing Systems.** (3:3:2) F, W, Sp, Su Prerequisite: C S 142 or concurrent enrollment.

How a computer works, from hardware to high-level programming: logic circuits, computer instructions, assembly language, binary arithmetic, C programming, program translation, data structures, algorithm analysis.

**199R. Academic Internship.** (1–3:Arr.:Arr. ea.) Prerequisite: department chair's and cooperative education coordinator's consent.

Work experience evaluated by supervisor and posted on student's transcript.

**212. Circuit Analysis and Laboratory.** (5:4:3) F, W, Sp Prerequisite: Phscs 220; Math 113; professional status.

Analysis of electric circuits; sinusoidal-steady state, resonance, Bode plots, and balanced three-phase circuits. Includes labs. To be taken semester of admittance to professional program. Fee.

**224. (EC En-C S) Fundamentals of Digital Systems.** (3:3:2) F, W, Su Prerequisite: EC En 124.

Digital logic: theory, design, and implementation of combinational and sequential logic. Laboratory experience in construction of digital logic circuits. Fee.

**301. Elements of Electrical Engineering.** (3:3:1) F, W, Sp

Prerequisite: Phscs 220, Math 334.

Linear electrical circuits, computer organization, and logic circuits for nonmajors. Fee.

**313. Electronic Circuit Design 1.** (4:4:2) F, W, Sp Prerequisite: EC En 212.

Analysis and design of linear and nonlinear electronic circuit building blocks.

**317. Electronics Laboratory 1.** (1:0:3) F, W, Sp Prerequisite: EC En 313 or concurrent enrollment.

Measurement and design of basic electronic building blocks.

**320. Digital System Design.** (3:3:3) F, W Prerequisite: EC En 212; EC En–C S 224.

Advanced digital design, including hardware description languages, electrical properties of digital circuits, synchronous and asynchronous circuits, computer arithmetic, and interfacing to external circuitry.

**324. (EC En-C S) Computer System Architecture.** (3:3:1) F, W, Sp Prerequisite: EC En–C S 224; C S 235.

Performance-directed design principles, advanced pipelining, instruction-level parallelism (superscalar and VLIW CPUs), compiler optimizations, memory hierarchy design, etc.

**360. Transmission Lines and Introductory Fields.** (4:4:2) F, W Prerequisite: Math 214, 334, EC En 212.

Properties and application of transmission lines. Introduction to electric and magnetic field theory and development of Maxwell's equations.

**361. Transmission Lines and Introductory Fields Laboratory.** (1:0:3) F, W Prerequisite: EC En 360 or concurrent enrollment.

Experiments and measurement techniques in static and time-varying fields. Transmission line design and measurements. Microwave generation, propagation, detection, and hardware components.

**362. Transmission Line Fundamentals for High-Speed Digital Systems.** (2:1:3) F, W Prerequisite: EC En 212, Math 334; computer engineering major status.

Transmission lines for high-speed digital systems. Lab.

**370. Probability Theory.** (3:3:0) F, W Prerequisite: Math 343.

Axiomatic probability theory, conditional probability, discrete/continuous random variables, expectation, conditional expectation, moments, functions of random variables, multivariate distributions, laws of large numbers, central limit theorem.

**380. Signals and Systems.** (5:4:3) F, W, Sp Prerequisite: EC En 212, Math 334.

Time and frequency domain analysis of discrete or continuous systems subjected to periodic or nonperiodic input signals.

**391. Junior Seminar.** (0.5:1:0) F Prerequisite: EC En 212.

Seminars and colloquia on current topics in electrical and computer engineering, as well as ethics, contemporary issues, and lifelong learning. Attendance and some writing required.

**425. Real-Time Operating Systems.** (4:3:3) F Prerequisite: EC En-C S 324.

Hardware/software interface, real-time kernel internals, implementation of high-level language constructs, issues in real-time application software development.

**427. Embedded Systems.** (4:3:3) F Prerequisite: EC En 320; EC En-C S 324.

Interfacing digital hardware components to an embedded system processor. Developing the hardware-software interface. Developing application software. Using C and assembly language in device-driver design, monitor-debugger, and real-time kernel. Lab.

**443. Communication and Power Circuits.** (4:3:3) W Prerequisite: EC En 313, 317.

Introduction to amplitude modulation, frequency modulation, and phase modulation circuits. Modulators, mixers, detectors, and the phase-locked loop. Power amplifier stage and oscillator design.

**445. Introduction to Mixed-Signal VLSI.** (4:3:3) F Prerequisite: EC En 313.

VLSI circuit design emphasizing mixed-signal circuits such as D/A and A/D converters, phase-locked loops, S/H circuits. Associated laboratory provides layout-design experience.

**450. Introduction to Semiconductor Devices.** (3:3:1) W Prerequisite: EC En 313, Phcs 281.

Physics of electronic and optical solid state devices; includes semiconductor materials, bipolar and FET device physics and modeling, optical properties of semiconductors, and lasers.

**451. Introduction to Digital VLSI Circuits.** (4:3:5) W Prerequisite: EC En 313, 320.

Design of very large-scale integrated circuits for digital systems. CAD tools used extensively to simulate the design and create and verify mask circuits.

**452. Experiments in Integrated Circuit Development.** (1:0:3) W Prerequisite: EC En 450 or concurrent enrollment.

Measurements of key silicon properties and fabrication of integrated circuits.

**455. VLSI Testing.** (1:0:3) F Prerequisite: EC En 451 or 445.

Testing of ICs designed previous semester in EC En 451 or EC En 445. Topics in VLSI-testable circuit designs.

**462. Electromagnetic Radiation and Propagation.** (2:3:1) F 1st blk. Prerequisite: EC En 360.

Electromagnetic and optical theory including guided wave theory, modes, propagation in materials, radiation analysis, antenna analysis, and aperture diffraction.

**464. Wireless Communication Circuits.** (2:3:1) F 2nd blk. Prerequisite: EC En 462 or instructor's consent.

Analysis, design, and fabrication of RF/microwave passive circuit structures, amplifiers, oscillators, and mixers. System concepts, including stability, gain, and noise figure.

**466. Introduction to Optical Engineering.** (2:3:1) F 2nd blk. Prerequisite: EC En 462.

Principles and practices of optical engineering including optical communications system and components.

**483. (EC En-Me En 431) Design of Control Systems.** (3:3:0) F Prerequisite: EC En 380 or Me En 335.

Classical frequency response and time domain design of control systems. State-variable control and computer simulation of control systems.

**485. Introduction to Digital Communication Theory.** (4:3:3) F Prerequisite: EC En 370, 380.

Analysis and design of digital communications systems in AWGN: signal space concepts, modulation, matched filter and correlation detection, synchronization, performance. Computer-based design exercises.

**487. Introduction to Discrete-Time Signal Processing.** (4:3:3) W Prerequisite: EC En 370, 380.

Digital signal processing, fast Fourier transforms, digital filter design, spectrum analysis. Applications in speech processing, SONAR, communications, etc.

**490. Team Design Project.** (4:2:6) F, W Prerequisite: selected 400-level electrical and computer engineering courses, depending on the specific project.

Culminating design experience based on skills learned in advanced technical courses. Students work in teams to plan, design, test, and demonstrate a major project.

**493R. Special Topics in Electrical and Computer Engineering.** (1-4:Arr.:Arr. ea.) F, W, Sp, Su

Topics vary. Recent developments in electrical and computer engineering.

## **500-Level Graduate Courses (available to advanced undergraduates)**

**522R. Special Topics in Computer Systems.** (1-3:Arr.:Arr. ea.) Prerequisite: instructor's consent.

**523. Queueing Theory and Modeling Fundamentals.** (3:3:0) Prerequisite: EC En 380 or concurrent enrollment; EC En 370 or equivalent.

Computer systems and network modeling using stochastic processes: queueing theory models, performance analysis, resource allocations, large-system response parameters.

**541. Active and Passive Filter Design.** (3:3:0) Prerequisite: EC En 313, 380; or equivalents.

Design methods for electronic filters based on passive components, active components, and integrated circuit components.

**542R. Special Topics in Electronics.** (1-3:Arr.:Arr. ea.) Prerequisite: instructor's consent.

**543. CMOS Amplifier Design.** (3:3:0) Prerequisite: EC En 443 or 445 or equivalent.

Factors affecting performance of MOS devices in analog applications. Design of MOS amplifiers, buffers, and comparators.

**548. Analog CMOS Circuit Design.** (3:3:0) Prerequisite: EC En 443 or 445 or equivalent.

Design of CMOS comparators, wideband amplifiers, bandgap references; multipliers, PTAT generators, charge-transfer amplifiers, chopper-stabilized amplifiers, and advanced D/A and A/D CMOS architectures.

**549. VLSI Communication Circuit Design.** (3:3:0) Prerequisite: EC En 443 or 445 or equivalent.

Frequency synthesizers; low-jitter, voltage-controlled oscillators; high Q circuits; clock regeneration; phase-locked loops; frequency discriminators; and radio-on-a-chip concepts.

**550. (EC En-Me En) Microelectromechanical Systems (MEMS).** (3:3:0) Prerequisite: EC En 450 or Me En 372 or equivalent.

Design, fabrication, and applications of MEMS. Mechanical properties governing their design and reliability and the processing technologies used to fabricate them.

**555. Optoelectronic Devices.** (3:2:1) F Prerequisite: EC En 450 or equivalent or instructor's consent.

Design, operation, and fabrication of modern optoelectronic devices, including photodiodes, photovoltaics, LEDs, and lasers.

**560. Electromagnetic Wave Theory.** (3:3:0) Prerequisite: EC En 462 or equivalent.

Principles and methods of modern electromagnetic wave theory: anisotropic media, dyadic Green functions, Nuygen's principle, contour integration methods, asymptotic integration. Applications in radiation and scattering.

**562. Optical Communication Components and Systems.** (3:3:0)

Prerequisite: EC En 462, 466; or equivalents.

Fiber-optic communication system components and their operating and performance characteristics.

**563. Applied Computational Electromagnetics.** (3:3:0)

Prerequisite: EC En 462 or equivalent.

Current theory and practice in numerically solving Maxwell's equations for antenna and circuit design and radar-scattering prediction.

**564. Radar and Communication Systems.** (3:3:0) Prerequisite: EC En 462, 485; or equivalents.

Design and performance of radar and communication systems: radar equation ambiguity functions, modulation, signal detection, link budgets, spread spectrum, system design, and performance trade-offs.

**568. Microwave Remote Sensing.** (3:3:0) Prerequisite: instructor's consent.

Emphasis on space-borne remote sensing of the earth's atmosphere, land, and oceans. Primary methods and applications for both active (radar) and passive (radiometry).

## Graduate Courses

For 600- and 700-level courses, see the BYU 2007–2008 Graduate Catalog.

## Electrical and Computer Engineering Faculty

### Professors

- Christiansen, Richard W. (1978) BS, Rutgers U., 1961; MS, U. of New Mexico, 1966; PhD, U. of Utah, 1976.
- Comer, David J. (1981) BSEE, San Jose State U., 1961; MSEE, U. of California, Berkeley, 1962; PhD, Washington State U., 1966.
- Comer, Donald T. (1995) BS, San Jose State U., 1959; MS, U. of California, Berkeley, 1961; PhD, U. of California, Santa Clara, 1968.
- Hutchings, Brad (1992) BS, MS, PhD, U. of Utah, 1984, 1987, 1992.
- Jensen, Michael (1994) BS, MS, Brigham Young U., 1990, 1991; PhD, U. of California, Los Angeles, 1994.
- Long, David G. (1990) BS, MS, Brigham Young U., 1982, 1983; PhD, U. of Southern California, 1989.
- Nelson, Brent E. (1984) BS, MS, PhD, U. of Utah, 1981, 1983, 1984.
- Nordin, Gregory P. (2005) BS, Brigham Young U., 1984; MS, U. of California, Los Angeles, 1986; PhD, U. of Southern California, 1992.
- Rice, Michael D. (1991) BS, Louisiana Tech U., 1987; MS, PhD, Georgia Inst. of Technology, 1989, 1991.
- Selfridge, Richard H. (1987) BS, California State U., Sacramento, 1978; MS, PhD, U. of California, Davis, 1980, 1984.
- Stirling, Wynn C. (1984) BS, MS, U. of Utah, 1969, 1971; PhD, Stanford U., 1983.
- Swindlehurst, A. Lee (1990) BS, MS, Brigham Young U., 1985, 1986; PhD, Stanford U., 1991.

### Associate Professors

- Archibald, James K. (1987) BS, Brigham Young U., 1981; MS, PhD, U. of Washington, 1983, 1987.
- Beard, Randal W. (1996) BS, U. of Utah, 1991; MS, PhD, Rensselaer Polytechnic Inst., 1993, 1995.
- Frost, Richard L. (1987) BS, MS, PhD, U. of Utah, 1975, 1977, 1979.
- Hawkins, Aaron R. (2002) BS, California Inst. of Technology, 1994; MS, PhD, U. of California, Santa Barbara, 1996, 1998.
- Jeffs, Brian D. (1990) BS, MS, Brigham Young U., 1978, 1982; PhD, U. of Southern California, 1989.
- Lee, Dah-Jye (2001) BS, National Taiwan U. of Science and Technology, 1984; MS, PhD, Texas Technological U., 1987, 1990.

Warnick, Karl F. (2000) BS, PhD, Brigham Young U., 1994, 1997.

Wilde, Doran (1995) BS, Brigham Young U., 1978; MS, PhD, Oregon State U., 1993, 1995.

Wirthlin, Michael J. (1999) BS, PhD, Brigham Young U., 1992, 1997.

### Assistant Professors

Oliphant, Travis (2001) BS, MS, Brigham Young U., 1995, 1996; PhD, Mayo Graduate School, 2000.

Penry, David A. (2006) BSE, MS, Case Western Reserve U., 1992, 1992; MBA, Ohio State U., 1994; MA, PhD, Princeton U., 2002, 2006.

Schultz, Stephen M. (2002) BS, MS, Brigham Young U., 1992, 1994; PhD, Georgia Inst. of Technology, 1999.

Taylor, Clark N. (2004) BS, MS, Brigham Young U., 1995, 1999; PhD, U. of California, San Diego, 2004.

### Emeriti

Bearnson, Leroy W. (1972) BS, U. of Utah, 1961; MS, Syracuse U., 1965; PhD, Auburn U., 1970.

Berrett, Paul O. (1964) BS, U. of Utah, 1953; MS, U. of Southern California, 1955; PhD, U. of Utah, 1965.

Bowman, Lawrence S. (1967) BS, MS, PhD, U. of Utah, 1957, 1961, 1964.

Chabries, Douglas M. (1978) BS, U. of Utah, 1966; MS, California Inst. of Technology, 1967; PhD, Brown U., 1970.

Chaston, A. Norton (1957) AS, U. of Idaho, 1944; BS, U. of Utah, 1951; MS, Brigham Young U., 1963.

Clegg, John C. (1961) BS, MS, PhD, U. of Utah, 1949, 1954, 1957.

Humpherys, Deverl S. (1964) BS, Brigham Young U., 1955; MS, U. of Utah, 1957; PhD, U. of Illinois, 1963.

Jonsson, Jens J. (1953) BS, BS, U. of Utah, 1944, 1947; MS, PhD, Purdue U., 1948, 1951.

Losee, Ferril A. (1965) BS, U. of Utah, 1953; MS, U. of Southern California, 1957.

Miner, Gayle F. (1960) BS, MS, U. of Utah, 1959, 1960; PhD, U. of California, Berkeley, 1969.

Ward, David M. (1964) BS, Stanford U., 1959.

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## Elementary Education

See Teacher Education.