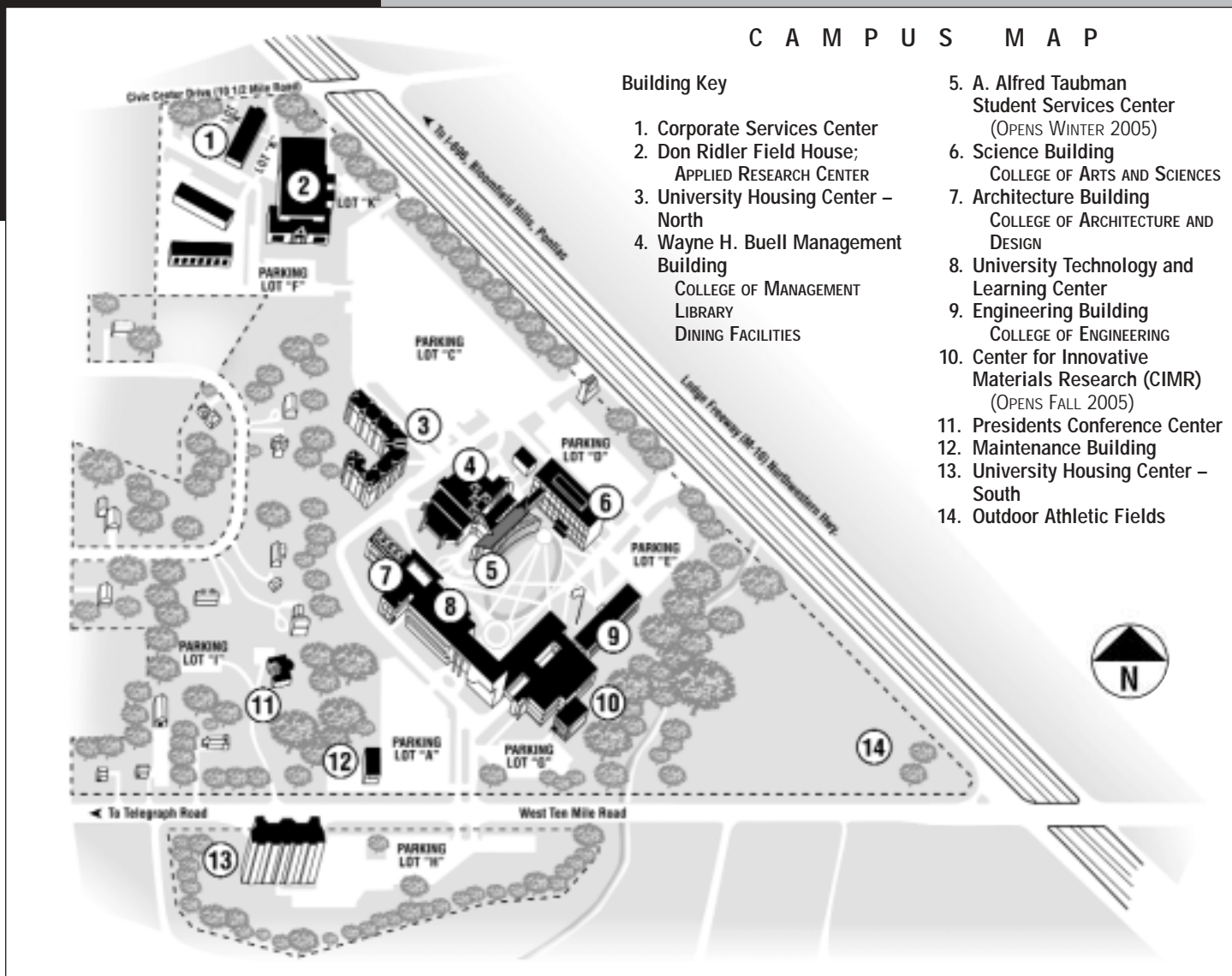


# LAWRENCE TECHNOLOGICAL UNIVERSITY®



2005-2007  
UNDERGRADUATE CATALOG 2005-2007

## CAMPUS MAP



### Building Key

1. Corporate Services Center
2. Don Ridler Field House;  
APPLIED RESEARCH CENTER
3. University Housing Center – North
4. Wayne H. Buell Management Building  
COLLEGE OF MANAGEMENT  
LIBRARY  
DINING FACILITIES

5. A. Alfred Taubman Student Services Center  
(OPENS WINTER 2005)
6. Science Building  
COLLEGE OF ARTS AND SCIENCES
7. Architecture Building  
COLLEGE OF ARCHITECTURE AND DESIGN
8. University Technology and Learning Center
9. Engineering Building  
COLLEGE OF ENGINEERING
10. Center for Innovative Materials Research (CIMR)  
(OPENS FALL 2005)
11. Presidents Conference Center
12. Maintenance Building
13. University Housing Center – South
14. Outdoor Athletic Fields

### VISIT THE CAMPUS

Lawrence Technological University welcomes prospective students, family members, employers, and others to visit. While on campus, prospective students are encouraged to discuss their educational plans with admissions staff and to meet current Lawrence Tech students, professors, or deans. Call the Admissions Office toll free at 1.800.CALL.LTU (225.5588) to arrange an appointment or to request additional information. The Admissions Office is open (except holidays) Monday-Thursday 8 a.m.-8 p.m., and Friday 8 a.m.-4:30 p.m. If you plan to visit during the summer, please contact the Admissions Office for summer hours.

### ON THE COVER

Lawrence Tech's 120-acre full-service campus provides a full range of academic, recreational, and residential facilities, along with convenient access to major freeways. Southeastern Michigan is one of America's hubs of business and commerce, the site of some of the world's outstanding accomplishments. Large photo is the University Technology and Learning Center.

### ABOUT THIS GRADUATE CATALOG

This *Undergraduate Catalog* is a compendium of opportunities available at Lawrence Technological University. It includes information on academic programs, requirements for admission and graduation, rules, regulations, and expectations. Failure to read this *Undergraduate Catalog* does not excuse

students from the requirements and regulations described herein. While every effort is made to provide accurate and current information, the University reserves the right to change rules, policies, fees, curricula, courses, and other programs described to reflect faculty or administrative action. This *Undergraduate Catalog* is accurate as of the publication date. For information about undergraduate programs, refer to Lawrence Tech's *Graduate Catalog*.

### CONTACTING LAWRENCE TECH

The University's address is: 21000 West Ten Mile Road, Southfield, MI 48075-1058. The main phone number is 248.204.4000. Visit Lawrence Tech on the web at [www.ltu.edu](http://www.ltu.edu).

### NOTICE OF NON-DISCRIMINATORY POLICY

Lawrence Technological University adheres and conforms to all federal, state, and local civil rights regulations, statutes and ordinances. No person, student, faculty or staff member will knowingly be discriminated against relative to the above statutes. LAWRENCE TECHNOLOGICAL UNIVERSITY IS AN EQUAL OPPORTUNITY EMPLOYER.

### STUDENT IMAGES

Lawrence Technological University reserves the right to use images of student work and of students on campus, or at any of its offsite locations, for the purpose of promoting the University. Students not wishing to be photographed should notify the Registrar in writing when they register each semester.





# LAWRENCE TECHNOLOGICAL UNIVERSITY®



## ANNOUNCEMENT OF GENERAL INFORMATION AND COURSES IN THE COLLEGES OF

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- ARCHITECTURE AND DESIGN
  - ARTS AND SCIENCES
  - ENGINEERING
  - MANAGEMENT
- 



FOR THE ACADEMIC YEARS 2005-2007

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# 2005-2007

UNDERGRADUATE CATALOG 2005-2007



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# ACADEMIC SCHEDULE 2005 - 2007

## FALL 2004 SEMESTER

April 5-9	Advance Registration
April 10-August 25	Registration
August 24	Last day to register without late fee
August 25	Classes begin; late registration fee applies
August 26	Add/Drop period begins
September 4	Last day of classes before Labor Day recess
September 7	Classes resume
September 8	Last day to drop with 100% tuition credit
September 9	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
November 17	Last day to withdraw
November 24	Last day of classes before Thanksgiving recess
November 29	Classes resume
December 10	Last day of classes before final exams
December 13-16	Final exam week
December 17	Fall 2004 semester ends

## SPRING 2005 SEMESTER

November 1-5	Advance registration
November 6-	
January 10	Registration
January 7	Last day to register without late registration fee
January 10	Classes begin; late registration fee applies
January 11	Add/Drop period begins
January 21	Last day to drop classes with 100% tuition credit
January 22	Withdrawal period begins; late transaction fee applies for courses added
January 17*	Martin Luther King Day Celebration
March 5	Last day of classes before mid-semester break
March 7-11	Mid-semester break
March 14	Classes resume
April 8	Last day to withdraw
April 29	Last day of classes before final exams
May 2-6	Final exam week
May 15	Commencement
May 16	Spring 2005 semester ends

## SUMMER 2005 SEMESTER

### Summer Session A:

April 4- 8	Advance Registration
April 9-May 17	Registration
May 17	Last day to register without a late fee
May 18	Classes begin; Late registration fee applies
May 19	Add/Drop period begins
May 24	Last day to drop classes with 100% tuition credit
May 25	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
May 28	Last day of classes before Memorial Day
May 31	Classes resume
June 15	Last day to withdraw
June 29	Summer 2005 Session A ends

### Summer Session B:

April 4-8	Advance Registration
April 9-July 8	Registration
July 8	Last day to register without a late fee
July 11	Classes begin; Late registration fee applies
July 12	Add/Drop period begins
July 15	Last day to drop classes with 100% tuition credit
July 16	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
August 12	Last day to withdraw
August 20	Summer 2005 Session B ends

### Summer Session E:

April 4-8	Advance Registration
April 9-May 17	Registration
May 17	Last day to register without late fee
May 18	Classes begin; Late registration fee applies
May 19	Add/Drop period begins
May 28	Last day of classes before Memorial Day
May 31	Classes resume
June 2	Last day to drop classes with 100% tuition credit
June 3	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
July 13	Last day to withdraw
July 28	Last day of classes

The University reserves the right to make adjustments to the academic calendar as necessary.

\*The University is open and classes are held on Martin Luther King Day.

To afford an opportunity to all members of the University community, students, faculty, and staff who may desire to participate in the Freedom Walk celebrating Dr. Martin Luther King's life and legacy, upon request, may be excused from any scheduled classes, office hours, meetings, etc. from 11 a.m.-1 p.m. Temporary help, substitute instruction, rescheduling, etc. will be provided as needed. During this period, all mandatory activities such as exams, presentations or other graded activities will be deferred, although assignments may be made by email for subsequent sessions.

# ACADEMIC SCHEDULE 2005 - 2007

## FALL 2005 SEMESTER

April 4-8	Advance Registration
April 9- August 31	Registration
August 30	Last day to register without late fee
August 31	Classes begin; late registration fee applies
September 1	Add/Drop period begins
September 3	Last day of classes before Labor Day recess
September 6	Classes resume
September 14	Last day to drop classes with 100% tuition credit
September 15	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
November 23	Last day to withdraw
November 23	Last day of classes before Thanksgiving recess
November 28	Classes resume
December 16	Last day of classes before final exams
December 19-23	Final exam week
December 23	Fall 2005 semester ends

## SPRING 2006 SEMESTER

October 31 - November 4	Advance Registration
November 5 - January 16	Registration
January 15	Last day to register without late fee
January 16	Classes begin; late registration fee applies
January 16	Martin Luther King Day Celebration*
January 17	Add/Drop period begins
January 27	Last day to drop classes with 100% tuition credit
January 28	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
March 11	Last day of classes before mid-semester break
March 13-17	Mid-semester break
April 14	Last day to withdraw
May 5	Last day of classes before final exams
May 8-12	Final exam week
May 21	Commencement
May 22	Spring 2006 semester ends

## SUMMER 2006 SEMESTER

### Session A:

April 3-7	Advance Registration
April 8- May 17	Registration
May 16	Last day to register without late fee
May 17	Classes begin; late registration fee applies
May 18	Add/Drop period begins
May 23	Last day to drop classes with 100% tuition credit
May 24	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
May 27	Last day of classes before Memorial Day
May 30	Classes resume
June 14	Last day to withdraw
June 28	Summer 2006 Session A ends

### Session B:

April 3-7	Advance Registration
April 8- July 10	Registration
July 9	Last day to register without late fee
July 10	Classes begin; late registration fee applies
July 11	Add/Drop period begins
July 14	Last day to drop classes with 100% tuition credit
July 15	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
August 4	Last day to withdraw
August 19	Summer 2006 Session B ends

### Session E:

April 3-7	Advance Registration
April 8-May 17	Registration
May 16	Last day to register without late fee
May 17	Classes begin; late registration fee applies
May 18	Add/Drop period begins
May 27	Last day of classes before Memorial Day
May 30	Classes resume
May 30	Last day to drop classes with 100% tuition credit
May 31	Withdrawal period begins for dropped classes; late transaction fee applies for courses added
July 12	Last day to withdraw
July 27	Summer 2006 Session E ends

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# ACADEMIC SCHEDULE 2005 – 2007

## FALL 2006 SEMESTER

April 3 – 7	Advance Registration
April 8 – August 29	Regular Registration
August 29	Last day to register without late fee
August 30	Classes begin; add/drop period begins/ late registration fee applies
September 2	Last day of classes before Labor Day recess
September 5	Classes resume
September 12	Last day to drop classes with tuition refund (no refund for classes dropped after September 12)
September 13	Withdrawal period begins; late transaction fee applies for each course added
November 22	Last day to withdraw
November 22	Last day of classes before Thanksgiving recess
November 27	Classes resume
December 17	Last day of classes before finals
December 18 – 22	Final Exam Week
December 22	Fall 2006 semester ends

## SPRING 2007 SEMESTER

November 6- 10	Advance Registration
November 11 –	
January 14	Regular Registration
January 14	Last day to register without late fee
January 15	Classes begin; add/drop period begins/ late registration fee applies
January 15	Martin Luther King Day Celebration*
January 26	Last day to drop classes with tuition refund (no refund for classes dropped after January 26)
January 27	Withdrawal period begins; late transaction fee applies for each course added
March 10	Last day of classes before mid-semester break
March 12 – March 17	Mid-semester break
April 9	Last day to withdraw
May 5	Last day of classes before final exams
May 7 – 11	Final exam week
May 20	Commencement
May 21	Spring 2007 semester ends

## SUMMER 2007 SEMESTER

### Session A:

April 2 - 6	Advance Registration
April 7 - May 15	Regular Registration
May 15	Last day to register without late fee
May 16	Classes begin; add/drop period begins/ late registration fee applies
May 22	Last day to drop classes with tuition refund (no refund for classes dropped after May 22)
May 23	Withdrawal period begins; late transaction fee applies for each course added
May 26	Last day of classes before Memorial Day recess
May 29	Classes resume
June 13	Last day to withdraw
June 27	Summer 2007 Session A ends

### Session B:

April 2 – 6	Advance Registration
April 7 – July 8	Regular Registration
July 8	Last day to register without late fee
July 9	Classes begin; add/drop period begins/ Late registration fee applies
July 13	Last day to drop classes with tuition refund (no refund for classes dropped after July 13)
July 14	Withdrawal period begins; late transaction fee applies for each course added
August 3	Last day to withdraw
Summer	2007 Session B ends

### Session E:

April 2 – 6	Advance Registration
April 7 – May 15	Regular Registration
May 15	Last day to register without late fee
May 16	Classes begin; add/drop period begins/ late registration fee applies
May 29	Last day to drop classes with tuition refund (no refund for classes dropped after May 29)
May 30	Withdrawal period begins; late transaction fee applies for each course added
May 26	Last day of classes before Memorial Day recess
May 29	Classes resume
July 4	No classes – Fourth of July
July 5	Classes resume
July 11	Last day to withdraw
July 26	Summer 2007 Session E ends

The University reserves the right to make adjustments to the academic calendar as necessary.

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# ACADEMIC SCHEDULE 2005 – 2007

## FALL 2007 SEMESTER

April 2 – 6	Advance Registration
April 7 – August 28	Regular Registration
August 28	Last day to register without a late fee
August 29	Classes begin; add/drop period begins/ late registration fee applies
September 1	Last day of classes before Labor Day recess
September 4	Classes resume
September 11	Last day to drop classes with tuition refund (no refund for classes dropped after September 11)
September 12	Withdrawal period begins; late transaction fee applies for each course added
November 21	Last day to withdraw
November 21	Last day of classes before Thanksgiving recess
November 26	Classes resume
December 15	Last day of classes before finals
December 17 – 22	Final Exam Week
December 22	Fall 2007 semester ends

## SPRING 2008 SEMESTER

November 5- 9	Advance Registration
November 10 – January 13	Regular Registration
January 13	Last day to register without a late fee
January 14	Classes begin; add/drop period begins/ late registration fee applies
January 21	Martin Luther King Day Celebration*
January 25	Last day to drop classes with tuition refund (no refund for classes dropped after January 25)
January 26	Withdrawal period begins; late transaction fee applies for each course added
March 8	Last day of classes before mid-semester break
March 10 – March 15	Mid-semester break
April 7	Last day to withdraw
May 3	Last day of classes before final exams
May 5 – 10	Final exam week
May 18	Commencement
May 19	Spring 2008 semester ends

## SUMMER 2008 SEMESTER

### Session A:

March 31 – April 4	Advance Registration
April 5 - May 13	Regular Registration
May 13	Last day to register without a late fee
May 14	Classes begin; add/drop period begins/ late registration fee applies
May 20	Last day to drop classes with tuition refund (no refund for classes dropped after May 20)
May 21	Withdrawal period begins; late transaction fee applies for each course added
May 24	Last day of classes before Memorial Day recess
May 27	Classes resume
June 11	Last day to withdraw
June 25	Summer 2008 Session A ends

### Session B:

March 31 – April 4	Advance Registration
April 5 – July 6	Regular Registration
July 6	Last day to register without a late fee
July 7	Classes begin; add/drop period begins/ Late registration fee applies
July 11	Last day to drop classes with tuition refund (no refund for classes dropped after July 11)
July 12	Withdrawal period begins; late transaction fee applies for each course added
August 1	Last day to withdraw Summer 2008 Session B ends

### Session E:

March 31 – April 4	Advance Registration
April 5 – May 13	Regular Registration
May 13	Last day to register without a late fee
May 14	Classes begin; add/drop period begins/ late registration fee applies
May 27	Last day to drop classes with tuition refund (no refund for classes dropped after May 27)
May 28	Withdrawal period begins; late transaction fee applies for each course added
May 24	Last day of classes before Memorial Day recess
May 27	Classes resume
July 4	No classes – Fourth of July
July 5	Classes resume
July 9	Last day to withdraw
July 26	Summer 2008 Session E ends

The University reserves the right to make adjustments to the academic calendar as necessary.

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**L**awrence Technological University is an independent, co-educational accredited university founded in 1932 and offering over 60 academic programs at the associate, baccalaureate, master's, and doctoral degree level. The University is composed of Colleges of Architecture and Design, Arts and Sciences, Engineering, and Management. Approximately 5,000 students are enrolled in full-time, part-time, day, evening, credit, and non-credit programs.

Lawrence Tech combines the benefits of a close, caring, small college atmosphere with the academic depth and scope of a larger university. Lawrence Tech takes a personal approach to education, and the University attracts students who generally have made some big plans for themselves.

They're highly motivated students with a tremendous will to succeed, to excel, and to seek out the best in whatever they do.

Lawrence Tech has a reputation for excellence. Most students claim that the University's programs are tough and challenging -- programs that unapologetically demand commitment. At the same time, as a result of their educational preparation, Lawrence Tech graduates report (in numbers well above national norms) that they arrive in the workplace feeling prepared and ready to do their jobs.

Independent studies also confirm that Lawrence Tech students rapidly achieve placement success. In recent years, some 97 percent of graduates responding report finding career positions within a year. The American Society of Employers ranked Lawrence Tech first in its class as a

preferred provider of graduates to Southeastern Michigan employers. *Standard & Poor's* has historically ranked Lawrence Tech in the top third of all colleges and universities providing the leaders of America's most successful businesses.

The heritage and educational philosophy of the University is reduced to just three words in the University motto, adopted shortly after Lawrence Tech was founded in 1932 -- *"theory and practice."* It means that Lawrence Tech seeks to explain not only why something should work, but how it works in real situations and applications.

Much of the student's learning in this way will be gained directly from Lawrence Tech's professors. Many Lawrence Tech faculty have years of successful industrial and profes-

sional experience in addition to academic credentials from some of the nation's top universities and colleges. They've learned what succeeds in the "real" world, and they'll try to make sure that students do, too.

In addition, there is unusually close interaction between the University and the professions that its students and graduates serve. Assuring that academic programs provide students with the types of contemporary skills that employers value is a special goal. Remarkably, some 60 percent of students in recent graduating classes report holding a full-time job while going to school. Clearly, this is a student body that knows about the world of work and demands value.

Another attribute is the University's location in close proximity to some of the world's leading industrial, technological, business, and scientific enterprises. The relationship is more than geographic -- it assures the University's participation in "cutting edge" advancements and "front office" accessibility by students interested in co-op, part-time, and networking opportunities. Over 200 *Fortune 500* corporations have headquarters or major operations within a half-hour's drive of Lawrence Tech's campus.

Finally, Lawrence Tech students are strongly encouraged to interact with the professional world throughout their academic program. Dozens of professional societies are active on campus and help students network with men and women already working in specific fields. Many of the

academic programs also require participation in professional projects that seek to solve real problems facing practicing architects, engineers, managers, scientists, and others. The projects expose students to a host of real-world challenges, and Lawrence Tech students regularly earn top awards in competitions that pit them against students from other top colleges and universities.

There is an intangible “spirit” at Lawrence Tech – an earnest spirit of student and faculty enthusiasm for learning and living, and a spirit of motivation and desire to excel. It’s not confined to the classroom or the laboratory; it’s an all-encompassing feeling – both a reality and an ideal. Consider Lawrence Tech. Share the spirit!

## VISION, VALUES, AND MISSION

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Lawrence Technological University was founded as an independent non-profit institution of higher learning. On a regular basis, the University community – including trustees, administrators, staff, faculty, students, and alumni -- meets to review, establish, and achieve the ambitious goals set forth in the *Strategic Plan*, to reflect upon hopes for the future, and to elucidate the purposes for which Lawrence Tech operates and serves. The latest edition of Lawrence Tech’s *Strategic Plan* can be viewed on [www.edu.edu](http://www.edu.edu).

Part of this planning process is to review and direct the evolution of the vision, values, and mission statements that guide Lawrence Tech’s progress. These statements are:

**Vision:** Lawrence Tech is the recognized regional leader in focused technological and professional education.

**Values:** Integrity and Excellence; Trust and Teamwork.

**Mission:** Lawrence Tech develops leaders through innovative and agile programs embracing theory and practice.

## ACCREDITATION AND MEMBERSHIPS

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Lawrence Technological University is accredited by The Higher Learning Commission and a member of the North Central Association, [www.ncahigherlearningcommission.org](http://www.ncahigherlearningcommission.org); 312.263.0456. The NCA accreditation report is on file in the University’s library and is available for public review by patrons. Various graduate and undergraduate degree programs in architecture, interior architecture, illustration, business administration and management, chemistry, and engineering are additionally accredited through appropriate national professional agencies.

Lawrence Tech’s institutional memberships include the American Society for Engineering Education, the Association of Collegiate Schools of Architecture, the Association of Collegiate Business Schools and Programs, and the Association of American Colleges and

Universities. The University is also a member of the American Council on Education; Automation Alley; the College Board; Association of Governing Boards of Universities and Colleges; International Assembly for Collegiate Business Education; Association of Independent Colleges and Universities of Michigan; National Association of Independent Colleges and Universities; Council for Higher Education Accreditation; ESD, the Engineering Society; National Financial Aid Association; Michigan Student Financial Aid Administrators; Midwest Association of Student Financial Aid Administrators; and the National Association of Student Financial Aid Administrators. In addition, the University has membership in the Michigan and American Associations of Collegiate Registrars and Admissions Officers. It is a member of nearly all chambers of commerce in the surrounding counties of Oakland, Wayne, and Macomb, including Southfield and Greater Detroit. It is also a member of the U.S. Chambers of Commerce; the Michigan, Ohio, and National Associations of College Admissions Counselors; American Association of University Administrators; Association of College Administration Professionals; Advanced Acceptance Program; and the Michigan and National Associations for Foreign Student Affairs.

Faculty and staff are additionally members of a wide variety of local, state, and national professional organizations appropriate to their disciplines. Professional organizations with active student chapters at Lawrence Tech are listed in the Student Life section of this *Catalog*.

## DAY, EVENING, AND WEEKEND CONVENIENCE

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Lawrence Tech’s programs are designed for traditional students as well as for working professionals. Many programs are offered in both day and evening schedules and several are also available on weekends.

The great majority of the University’s bachelor’s degree classes are offered in day and evening schedules that complement each other. Lawrence Tech is one of only a few universities to offer a complete selection of bachelor’s and graduate degree programs in the evening. No stranger to providing the convenience of evening classes, Lawrence Tech pioneered some of the nation’s first such programs in 1932.

Undergraduate and graduate classes are usually offered on a semester calendar – two semesters of 16 weeks. The fall semester begins in late August and ends in mid-December. The spring semester begins in January and ends in mid-May. There are also short and long summer sessions that offer students the opportunity to accelerate and continue academic progress or make up deficiencies. Certain



programs may also be offered on special schedules that accelerate class meetings over shorter periods. Consult the Registrar about these opportunities.

## CLASSES AND FACULTY

Lawrence Tech's moderate size encourages close interaction between students, faculty, and staff. Classes are generally small, especially for upper-classmen, and individual initiative is stressed.

Lawrence Tech has over 300 full- and part-time faculty. Exemplifying the University motto of "theory and practice," in addition to academic experience, many also bring a wealth of personal "real-world" research, business, or industrial experience to the classroom or laboratory. In addition to courses taught by Lawrence Tech's full-time professional faculty, it isn't unusual for students in appropriate disciplines to take classes taught by adjunct faculty who are successful corporate executives, practicing accountants, managers, entrepreneurs, engineers, architects, attorneys, and scientists. Such exposure is deliberate on the part of the University and seeks to help students develop an awareness of the most current "real world" problem solving applications of their academic studies.

Lawrence Tech students find their professors are normally easily accessible, and



that they are eager to discuss individual questions, academic progress, or concerns outside of class. The University has a tradition of an "open door" policy in regard to faculty, department chairpersons, deans, the president, and other administrative staff.

## DIRECT STUDENT INTERACTION

The successful Lawrence Tech student generally arrives on campus with a full measure of ability and self-initiative. Self-initiative is Lawrence Tech's term for a proper combination of motivation and self-reliance. These students appreciate the University's position that it exists for, and interacts with, the student – not relatives, spouses, or friends wishing to represent them. The fact that Lawrence Tech students are of a maturity

that requires no such representation helps ensure that they are prepared for responsible full- or part-time employment during their academic career and, following graduation, for professional employment or continued study.

## AFTER GRADUATION

Lawrence Tech alumni include a distinguished group of engineers, architects, scientists, business executives, managers, technicians, attorneys, physicians, governmental officials, educators, and others holding key positions throughout the United States and around the world.

About 80 percent of Lawrence Tech's over 27,000 degree-holding alumni reside in Michigan and the Midwest,

but alumni also live in nearly every state and territory, as well as in Aruba, Australia, the Bahamas, Bermuda, Brazil, Canada, Chile, China, Colombia, Ecuador, England, France, Germany, Greece, Guyana, Hong Kong, Iran, Ireland, Israel, Jamaica, Japan, Jordan, Lebanon, Malaysia, Mexico, the Netherlands, Nigeria, Norway, Pakistan, Peru, Saudi Arabia, Scotland, Singapore, Sweden, Taiwan, Thailand, United Arab Emirates, Venezuela, and Zambia.

Lawrence Tech's Alumni Association is the international forum for active graduates. The Association hosts a full service website, [www.ltu.edu/alumni](http://www.ltu.edu/alumni), providing access to everything from lifetime email accounts and events calendars to job search assistance. The Association holds meetings and sponsors a variety of activities and services for members in Southeastern Michigan, chapters elsewhere in Michigan, and in Arizona, California, Colorado, Florida, Georgia, Illinois, Indiana, North Carolina, Ohio, and Texas. Several chapters based on academic interest are also active. The Alumni Relations Office coordinates alumni activities and serves as a campus liaison for alumni worldwide.

## YOUR CAMPUS AND COMMUNITY



**L**awrence Technological University's park-like 120-acre campus continues to expand. An exciting program of improvements is underway, and includes the \$14.9 million development of the **A. Alfred Taubman Student Services Center** and the adjacent Academic Quadrangle, as well as a new \$3.25 million Center for Innovative Materials Research. The Taubman Center redefines the student experience by providing convenient, centralized "one-stop" access to the resources students need to make the most of their academic experiences.

Lawrence Tech's location is considered by many to be among the University's greatest assets, providing many nearby opportunities for students to network with practicing professionals, participate in career-related organizations, and find internships, co-op

experiences, and full- and part-time employment during college and after graduation.

Located near the exact center of population of Southeastern Michigan, the University is situated in Oakland County, in the city of Southfield, a suburban community of approximately 75,000 people. For visitors traveling by car, the campus is about 30 minutes northwest of downtown Detroit. It is also about 30 minutes northeast of Detroit

Metropolitan Airport. Lawrence Tech is easily reached via the interstate highway system and is situated at the intersection of West Ten Mile Road and Northwestern Highway (M-10, the Lodge Freeway), just south of Interstate 696.

The campus is at the center of the world of real work, real problems to be solved, and real possibilities for a full professional and cultural life. Southeastern Michigan is a

hub of American business and industry. It is a manufacturing and corporate center, the site of some of the world's outstanding technological accomplishments, and a focal point for cultural activities and recreation.

Within recent years, the area has become identified as one of the nation's premier technology clusters, with over 19,000 technology companies and a technology workforce of 568,000. According to the



*A. Alfred Taubman Student Services Center (Opens Winter 2005)*

# YOUR CAMPUS AND COMMUNITY



*Architecture Building*



*Wayne H. Buell Management Building*



*Applied Research Center*



*Don Ridler Field House*

National Science Foundation, Michigan is the number one state in research and development intensity. *Industry Week* magazine says that Southeastern Michigan is North America's center for research and development for the automotive industry and the principal driver of manufacturing strength.

Within a 15-mile radius of campus are world headquarters for many of the nation's leading research, industrial, and manufacturing firms. More than 200 *Fortune 500* companies are headquartered or have major operations here. And while the area's economy is substantially more diverse than in the days when the region was dubbed the world's auto capital, fully one-third of all U.S. auto production still takes place within 70 miles of the campus -- in some of the planet's most sophisticated, highly automated, and innovatively managed work environments.

Lawrence Tech is a founding partner in the Oakland County Automation Alley SmartZone, the *Great Lakes Interchange*, one of the state's foremost concentrations of high tech enterprise and a magnet for business development. The University is also the designated Small Business



*Corporate Services Complex*



*Engineering Building*



*Science Building*



*University Housing Center-North*



*University Housing Center-South*



*Affleck House*

Development Center for Oakland County, with specialization in technology.

Oakland County ranks as the third wealthiest county in the nation among counties with populations in excess of one million. Retail sales in the county alone exceed those of nearly 20 individual states. The county is a leading center of international commercial activity and home to some 425 foreign-owned firms from 22 countries. About 35 percent of Michigan's R&D firms are here, and more than 50 percent of the nation's automotive supplier technical centers. Robotics firms in the county account for more than half of U.S. robotic sales.

Nearby recreational opportunities abound – over 450 lakes, five ski areas, nearly 30 public fishing sites, and more golf holes per capita than any place else in the country. Major entertainment facilities within a half hour drive include Pine Knob and Meadowbrook outdoor music theaters, the Pontiac Silverdome, the Palace of Auburn Hills (home of the NBA's Pistons), Joe Louis Arena (home of the NHL Red Wings), Ford Field (home of the NFL's Detroit Lions), and Comerica Park (home of the Detroit Tigers). Additional attractions include the Cranbrook Museums, Detroit Zoo, the Detroit Institute of Arts, Detroit Historical

Museum, Motown Museum, Henry Ford Museum and Greenfield Village, Detroit Science Center, Wright Museum of African-American History, and more.

Opening early in 2006, Lawrence Tech's **A. Alfred Taubman Student Services Center**, named for a former student and one of the University's most generous benefactors, is a 42,000 sq. ft. facility at the center of campus that provides convenient one-stop access to Admissions, Financial Aid, the Registrar, Cashier, Dean of Students, Career Services, Laptop HelpDesk, Academic Achievement Center, and more. The building is itself a living laboratory, incorporating



many energy efficient and environmentally friendly advancements.

Taubman Center and the academic buildings surround the **Academic Quadrangle**, which is being completely redeveloped with outdoor plazas, dining areas, fountains and water features, and other amenities for student relaxation, study, and socializing. What is expected to be the largest urban forest of specimen Champion Trees, cloned from some of the oldest, largest, and most historic trees in the nation, will be among the special features here and elsewhere on campus.

Lawrence Tech's **University Technology and Learning Center**, opened in 2001, is a \$20 million 87,000 sq. ft. building housing a variety of technology labs and studios. It also houses the University Gallery, Maibach Inter-Faith Lounge, Lear Auditorium, Denso Interactive Center, Media Services Studio, Lewis Veraldi Center for Educational Technology, and more. The building connects on either end to the **Architecture and Engineering Buildings**. The Architecture Building, completed in 1962, houses

classrooms, studios, and faculty offices for the College of Architecture and Design. A 325-seat auditorium is also located here, as well as a gallery for changing exhibits.

The **Wayne H. Buell Management Building** is a 115,000 sq. ft. structure dedicated in memory of Lawrence Tech's third president. Opened in 1982, it houses the College of Management, Library, Dining Commons (Café Lawrence), and Bookstore. A university lounge and the offices of the President, Provost, Admissions, Dean of Students, Career Services, Cooperative Education, Vice President for University Advancement, and Marketing and Public Affairs are also here. A fully enclosed three-story atrium hosts a variety of special events and offers an ATM.

Lawrence Tech's **Engineering Building** is undergoing expansion with addition of the **Center for Innovative Materials Research**. The Engineering Building was the first building on the Southfield campus when it opened in 1955 and an earlier expansion occurred in 1987. The building houses

classrooms, laboratories, and offices for the College of Engineering, as well as offices for the Vice President for Finance and Administration, Business Services, and Personnel Services.

The **Science Building**, opened in 1967, was extensively renovated and equipped with upgraded computer and multi-media equipment in 1999. It houses classrooms, laboratories, and faculty offices for the College of Arts and Sciences – including the Departments of Natural Sciences; Mathematics and Computer Science; and Humanities, Social Sciences and Communication. The Edward Donley Computer Center is also here. A 303-seat auditorium is located at the south end of the building.

Lawrence Tech's **University Housing Centers South and North**, opened respectively in 1977 and 2002, provide modern, fully furnished air-conditioned apartment units and together house some 600 students. See the Student Housing section of this *Catalog* for additional information.

The **Don Ridler Field House, Corporate Services Complex, and Applied Research Center**, added in 1987, together offer a wide variety of recreational, meeting, applied research, and educational facilities. The complex includes offices for Continuing Education and Professional Development, Small Business Development Center, Student Activities, and student organizations and clubs, including the Student Government and Interfraternal Council. **Ridler Field House** memorializes a beloved coach

and athletic director who led Lawrence Tech basketball teams of the 1940s and '50s to national prominence, and includes a 1,500-seat gymnasium, exercise track, weight and conditioning room, saunas, racquetball courts, and locker facilities.

The **Presidents Conference Center**, built in 1959 and substantially upgraded in 1996, offers facilities for group meetings and special events.

The **Maintenance Building** provides storage for supplies, maintenance and landscape equipment.

**Outdoor Athletic Facilities** include softball diamonds, and football and soccer practice fields.

Plenty of free, lighted, paved **parking** is available on campus. There are no restrictions limiting student use of automobiles; however, student vehicles must display a current registration permit. Students are expected to obey the University's parking and speed regulations. Parking for visitors and those with restricted mobility is designated and available near all buildings.

The **Gregor S. and Elizabeth B. Affleck House**, designed by Frank Lloyd Wright and completed in 1941, was given to the University in 1978 by the late Afflecks' children, (Mrs.) Mary Ann Lutomski and Gregor P. Affleck. The home is located in the nearby City of Bloomfield Hills. It is considered an outstanding example of Wright's work. The Affleck House is managed by the College of Architecture and Design.



Center for Innovative Materials Research (CIMR) (Opens Fall 2005)



## ACADEMIC COUNSELING AND TUTORIAL SERVICES

All new students, both freshmen and transfers, are expected to attend orientation sessions prior to or during their first semester on campus. During these sessions, student opportunities, responsibilities, and regulations are presented, and registration is completed. A number of University counselors are available for academic advice, personal counseling, and registration assistance. The coordinator of the Academic Achievement Center also works with the Colleges to coordinate tutorial services and services for students with disabilities. Contact the appropriate academic department or the Academic Achievement Center for information.

## ACADEMIC ACHIEVEMENT CENTER

The Academic Achievement Center (AAC) is a joint initiative between the College of Arts and Sciences and the Division of Student Affairs. This support service is free to all students, staff, and faculty. Students may stop in the AAC to meet with study groups, to study alone, or to get tutoring help for classes. Tutoring is offered for core classes in math, computer science, chemistry, physics, and writing. All sessions are conducted by appointment and are scheduled online from the my.ltu.edu homepage, Lawrence Tech's centralized portal for online services. To accommodate last-minute issues, Wednesdays and Sundays are reserved for walk-in sessions (no appointment necessary). The AAC is located on the first floor of the Science Building. In early 2006 it will move to the Taubman Center. Hours are

Monday - Thursday, 8 a.m.-8 p.m.; Friday, 8 a.m.-4:30 p.m. Weekend and summer hours vary and are posted at the AAC entrance.

## ACADEMIC SCHOLARSHIPS

A number of full and partial scholarship awards are available each year to on-campus students. Students may apply to the Office of Financial Aid or the chair of the Lawrence Tech Scholarship Committee for consideration after being on campus a minimum of two semesters, with a cumulative GPA of 3.00 or better. Academic scholarship awards are made on a competitive basis at the discretion of Lawrence Tech's Scholarship Committee. An application for upper-class scholarships is required and the deadline for submission is May 15 of each academic year. See the

Financial Aid section of this Catalog or contact the Office of Financial Aid for information.

## ATM (CASH) MACHINE

An automated teller machine (ATM), hosted by Huntington Bank, is located in the atrium of the Buell Management Building, and is available any time the building is open. This unattended station allows withdrawals, deposits, or account transfers, using debit cards with Cirrus, Plus, Pulse, Star, or Quest network logos or a Visa, MasterCard, Discover, or American Express credit card and a personal identification number. For local Huntington Bank branches, call 1.877.932.BANK (2265).

## BOOKSTORE

The University Bookstore, located in the atrium of the Buell Management Building, offers books, instruments, supplies, software, snacks, and a wide variety of other items. "Spirit shop" offerings include Lawrence Tech custom clothing, athletic apparel, gifts, and distinctive signature items. Hours: Monday - Thursday, 9 a.m.-7 p.m.; Friday, 9 a.m.-1 p.m.

## BUILDING HOURS

In general, campus facilities are open 7 a.m.-midnight, seven days a week, excluding holidays. Students may use facilities 24 hours per day provided the dean of their College, a faculty member, or faculty advisor has approved and forwarded to Campus Safety an extended access

hours authorization, preferably via email. Faculty members and faculty advisors should check with the dean of their respective college regarding the policy on allowing extended access to facilities of that college. The dean, faculty member, or advisor may forward extended access authorizations via email to [ltu\\_safety@ltu.edu](mailto:ltu_safety@ltu.edu). Please allow two working days for confirmation. Individuals found not in compliance with this policy may be subject to the University discipline system. Students using campus facilities, especially after hours, must carry their Lawrence Tech ID card with them and must present it if requested to do so by a Lawrence Tech Campus Safety officer.

## CAREER SERVICES

Career Services is much more than a place where students can go to find a job when they graduate. Career Services provides a wide variety of services and programs that, as early as the freshman year, can help students develop their career plans and establish career goals by identifying their abilities, values, and interests, and then targeting occupations that reflect those same abilities, values, and interests. The office can also help students gain experience in their chosen field.

Services include career advising, on-campus employment, cooperative education and internships, career workshops, resume critiques, mock interviews, career fairs, employer presentations, and

on-campus interviews. Career Services is also responsible for the Career Center section of Tech Net ([www.lawrencetech.net](http://www.lawrencetech.net)), the University's web-based information system. Students may post their resumes for viewing by prospective employers and can also view job postings.

The Office of Career Services is located in M130, Buell Management Building, and is open daily 8 a.m.-4:30 p.m.; with extended hours (until 7 p.m.) Monday-Wednesday during fall and spring semesters. The office moves to the Taubman Center early in 2006.

## COMPUTER RESOURCES

Lawrence Tech has taken aggressive steps to create a technological environment which assures that students are well prepared and positioned to take full advantage of advanced learning opportunities, greater access to educational resources, and ultimately, achieve a competitive edge in the workplace. Lawrence Tech's extensive computer resources help students as they learn, retain, analyze, present, use, and exchange complex technological and graphical information.

The University's wireless laptop computer initiative provides all undergraduates with a state-of-the-art notebook computer customized to their academic discipline with the latest releases of professional software. All registered students at Lawrence Tech receive a free computer account that includes access to email, Internet2, and protected storage on the University's servers.

Students, faculty, and staff can access their account from any campus terminal, personal computer, or laptop. Students, faculty, and staff are expected to obtain Internet service if they wish to access the system from off-campus. The University no longer provides modem-based access to the system. Additional information is available at [www.ltu.edu/computercenter](http://www.ltu.edu/computercenter).

The Southfield campus has wireless coverage using 802.11b technology. Users should set their ESSID to "LTU Wireless Network" to connect. This service is provided in all central campus buildings and the residence halls. Public printers are provided in the Computer Laboratory in S115. Additional public printers are located in University Housing South and North and in the library. The Computer Lab is open Monday-Friday, 8 a.m.-8 p.m. At the end of each term, hours are extended until 10 p.m., Monday-Thursday.

The Laptop Support HelpDesk provides walk-in support for student computer problems. It is located in T215, and staffed 7:30 a.m.-7:30 p.m., Monday-Thursday, and 8 a.m.-4:30 p.m. Fridays. Telephone support is also provided during these hours at 248.204.2330. The HelpDesk moves to the Taubman Center early in 2006.

**My.ltu.edu** – Lawrence Tech's comprehensive e-learning and services portal, [my.ltu.edu](http://my.ltu.edu), offers an expanding variety of resources and conveniences. Among them is Blackboard, a

comprehensive and flexible e-learning software platform that delivers the University's course management system, customized institution-wide portals, on line communities, and an advanced architecture that provides for Web-based integration with the University's administrative systems.

The University's course management system offers students the 24 hour/7 day per week access to professors and fellow students not available in the typical classroom environment. Professors can post their syllabi online, as well as class lectures and assignments for immediate retrieval anytime, anywhere. Other features available through Blackboard are discussion boards for posting questions and receiving answers to and from other students and the professor in the class, Virtual Chat Room capabilities for asynchronous communication with the entire class, and the Digital Drop Box, which enables students to send assignments to professors on-line.

Registering for classes, inquiries about account balances and financial aid disbursements, internal and external job searches, payment of balances, and access to the library databases are among the large number of the additional services that Lawrence Tech students have available through BannerWeb by accessing [my.ltu.edu](http://my.ltu.edu) via Lawrence Tech's Website, [www.ltu.edu](http://www.ltu.edu).

Training sessions, self-paced study courses, and other online assistance help students learn to use the computer – these aids are in addition to



programming classes. Electronic mail provides communication between students, faculty, and administrators, and is considered the official means of University communication. Professional state-of-the-art software is used by students and faculty in their fields of expertise. In addition, word processing, spread sheet, and graphics programs are available along with job search services from the Office of Career Services.

## CONTINUING EDUCATION AND PROFESSIONAL DEVELOPMENT

The University's Division of Continuing Education and Professional Development is a provider of non-degree programs in educational training and employee professional development. The Division offers a variety of services, including conferences, seminars, classroom training, corporate and professional training, distance learning, and teleconferences.

The Office of Insurance Studies offers a number of opportunities for insurance agents, brokers, and financial planners to enhance their knowledge of the industry by earning IIA and CPCU designations. The courses are approved by the state of Michigan for agents seeking to fulfill licensing requirements.

Lawrence Tech is a certified Microsoft Authorized Training Provider. Microsoft courses are designed to prepare individuals to become systems engineers, solution developers, product specialists, and trainers. In addition to Microsoft courses, the division is contin-

ually developing additional computer courses to meet the changing demands of business and industry.

Courses are also offered in the areas of leadership and management, computer science, engineering, and architecture and include training in such areas as supervisory skills, communication, finance, human resources, marketing, electronics, quality, customer service, design, and robotics. Programs for students in grades K-12 are also available.

For further information on professional programs and/or related meeting services, contact the Division at 248.204.4050.

## COOPERATIVE EDUCATION

The Cooperative Education program is a joint venture between the University, a selected employer, and the student. The Office of Career Services oversees the Cooperative Education program. Work assignments are related to the student's major field of study and are varied to provide a broad range of experience and training. The more a student progresses the more assignments grow in complexity and the more technical know-how they require.

Co-op students:

- gain excellent work experience;
- are paid for learning on the job;
- receive academic credit; and
- enhance their professional job search when they graduate, because employers favor students with co-op experience.

Lawrence Tech offers two types of cooperative education



programs. The traditional co-op program, also called the alternating program, allows students to alternate full-time college studies with three 15-week semesters of full-time work. A variation of the traditional program especially for civil engineering students takes into account the seasonal nature of the work and involves two semesters (summer and fall) worked back to back, followed by a spring semester of college studies and a final semester of summer work experience. Lawrence Tech also offers a parallel co-op program that allows students to work at least 20 hours per week while simultaneously attending classes and maintaining a full-time academic schedule.

To participate in the program, students must have at a

minimum 2.25 GPA. In the normal course of a complete co-op education program, a student will complete three semesters of work assignments before graduation. Each semester of co-op carries one academic credit, three of which may be applied toward an academic degree.

More than 100 students participate in Lawrence Tech's co-op program each year. Most assignments are in southeastern Michigan, however, students have completed assignments in Ohio, Indiana, Connecticut, California, Florida, Germany, and Mexico.

## DEAN OF STUDENTS

The Office of the Dean of Students serves as the central resource for activities that are coordinated through the Division of Student Affairs.

The dean of students serves as the primary advocate for students and works to insure that students are offered a quality college experience. Staff members in the Division of Student Affairs provide services to help students successfully complete their academic studies and coordinate opportunities for fellowship, fun, and rewarding college experiences. The Office of the Dean of Students offers personal, confidential, and nonbiased assistance in addressing any concerns a student may have regarding his or her rights or responsibilities as a member of the campus community. Services coordinated by the Office of the Dean of Students include:

**Student Events and Activities** – Staff coordinate annual social events to encourage students to interact with other students on campus. Popular programs include the fall semester Welcome Back Picnic, New Student Convocation, College Honors Reception, Coffee on Us programs, movie nights, and Pushing Honey Through awards for supportive family members.

**Service Learning Opportunities** – Service Learning combines classroom instruction with community service, focusing on critical, reflective thinking as well as personal and civic responsibility. Service Learning programs involve students in activities that address local needs while developing their academic skills and commitment to their community. All first-year stu-

dents in University Seminar courses participate in a service-learning activity during their first semester.

**Student Code of Conduct Adjudication Services** – Honesty, integrity, and caring are essential qualities of an educational institution, and a concern for values and ethics is important to the whole educational experience. The Student Code of Conduct outlines the rights and responsibilities and expected levels of conduct of students in the University community. Fundamental to the achievement of community among the members of the University is the recognition by all such members that each shares a responsibility to observe University regulations. This obligation, which is an extension of the citizen's responsibility to observe the law of the land, is an essential corollary to participation in the academic rights afforded to members of the University. A student voluntarily joins the Lawrence Technological University community and thereby assumes the obligation of abiding by the standards prescribed in the Student Code of Conduct. The University, through the Office of the Dean of Students, maintains the exclusive authority to impose sanctions for behaviors that violate the Student Code of Conduct.

**Support Services** – Students needing assistance with personal or academic challenges during their college career are welcome to contact staff in the Office of the Dean of Students, who can act as liaisons

between students and faculty. Academic study skills development and strategies for becoming self-efficient learners are provided by Student Affairs staff in the Academic Achievement Center and through Counseling Services (M130) in the Office of the Dean of Students at 248.204.4113. The dean's office will move to the Taubman Center early in 2006.

**DINING SERVICES**

Café Lawrence, located on the second floor of the Buell Management Building, is open during the fall and spring semesters and provides dining services for the entire campus community, including take-out meals, catering, special events, and more. Students may choose between a la carte dining or six-, nine-, or 12-meal-per-week plans. Declining balance credit accounts can also be purchased at Café Lawrence for use during the fall and spring semesters. Dining Services oversees the student-run coffee kiosk, LarryJoe's, located in the atrium of the Buell Management Building. This is a great place to meet fellow students to review notes or to get a quick bite to eat. Special events and dinners may be arranged with the dining services director.

**DUPLICATING FACILITIES**

Pay photocopying machines are located in the Library (machine accepts coins) and in the Academic Achievement Center (machine accepts copy

cards, which can be purchased in the Library).

**FAX SERVICE**

Fax services (send only) are available at the University Bookstore, which is located in the Buell Management Building. There is a modest fee for this service.

**FIELD HOUSE/RECREATION**

The Don Ridler Field House includes a gymnasium, weight and conditioning room, running track (1/11th mile), four racquetball/wallyball courts, and men's and women's locker rooms with showers and saunas.

**FIELD HOUSE HOURS**

<b>September – May</b>	
Monday	6:30 a.m.-10 p.m.
Tuesday	8 a.m.-10 p.m.
Wednesday	6:30 a.m.-10 p.m.
Thursday	8 a.m.-10 p.m.
Friday	6:30 a.m.- 9 p.m.
Saturday	9 a.m.- 5 p.m.
Sunday	12 p.m.- 5 p.m.
<b>June – August</b>	
Monday	8 a.m.- 9 p.m.
Tuesday	8 a.m.- 9 p.m.
Wednesday	8 a.m.- 9 p.m.
Thursday	8 a.m.- 9 p.m.
Friday	8 a.m.- 8 p.m.
Saturday	9 a.m.- 1 p.m.
Sunday	Closed

**FINANCIAL AID**

Approximately two-thirds of all students at Lawrence Tech receive some form of financial aid. Amounts and types vary by student, depending on need, merit or ability, and availability of funds. For a comprehensive listing of services, visit the Financial Aid section of this *Catalog*.

## IDENTIFICATION CARD

Lawrence Tech's student ID card combines a photo with a bar code and cash debit option. Instructions for applying for a card and an explanation of features are provided to new students at orientation.

## INTERNATIONAL STUDENTS

International students may receive assistance from the Office of International Student Affairs, located in MI30. Call 248.204.2408. The office will move to the Taubman Center early in 2006.

## LAPTOP SUPPORT HELPDESK

(See also Computer Resources and Computing and Network Policy.) The Laptop Support HelpDesk, located in T215, provides walk-in support for students with computer problems. Hours are Monday-Thursday, 7:30 a.m.-7:30 pm, and Friday, 8 a.m.-4:30 p.m. The HelpDesk moves to the Taubman Center early in 2006.

## LIBRARY

Lawrence Tech's Library is conveniently located on the first floor of the Buell Management Building and boasts an attractive indoor garden area. The Library houses a broad selection of books, periodicals, online databases and full-text electronic books, microforms, and other material that has been selected to enhance the curriculum areas of the University. Collection strengths include engineering, architecture, management, and technology.

Among its unique resources, the Library houses the 3,000-volume professional library of the late renowned architect Albert Kahn. The professional librarians are skilled in locating information both in the Lawrence Tech collection and at numerous other venues. They can also provide individualized and group instruction on how to use the Library efficiently. Students have full access to the stacks for browsing and independent research and can always count on getting personalized reference assistance from a librarian whenever the Library is open.

While the Library's catalog is available to the public on the Lawrence Tech website, premium content tailored to serve the needs of Lawrence Tech curricula is available online at <http://my.ltu.edu> (a password-protected site available to students using their Banner ID). The Library has negotiated agreements with many local and statewide academic and public libraries for direct borrowing privileges, or in some cases, for borrowing through a special arrangement. As an alternative, materials can be borrowed and shipped directly to Lawrence Tech from across the city or across the nation through the use of several sophisticated interlibrary loan programs. It is recommended that students make the Lawrence Tech Library their first stop when beginning a research project.

**Loan Privileges** – Lawrence Tech students may borrow most material from the Library for three weeks. Math videotapes circulate for shorter periods. Reserve and reference materials must be used in the

library. Students with fines or lost book charges of \$10 or more may not borrow library materials.

**Renewals** – Students may renew material as long as no one has requested the item. Students may renew books the first time through their online library accounts. Books that are overdue may only be renewed by contacting the Library. Call the circulation desk, 248.204.3009, to renew by phone (book bar code is needed) or bring the books to the Library.

**Overdue Materials** – *Overdue Charges*  
\$0.10 per item per day - books  
\$1.00 per item per day - instructional videos

**Lost Item Charge** – This includes replacement value, a service charge, and a maximum \$5 fine. Patrons with lost item charges or excessive overdue fines are not allowed to check out materials and an Academic Hold will be placed on their record.

**Library Account** – All students have a library account that may be accessed through the "My Account" feature of the Library's online catalog ([www.library.ltu.edu](http://www.library.ltu.edu)). Contact the library with questions. Once registered, students may place requests directly from the catalog, check their account for items checked out, fines, etc.

## LOCKERS

Lockers in the Engineering Building may be reserved through the office of the dean of the College of Engineering. Lockers in the Architecture Building may be reserved by calling the College of Architecture, 248.204.2880. Lockers in the University Technology Learning Center (UTLC) are reserved for students taking a studio class (call the facilities manager, 248.204.2858, or contact a professor teaching a studio class). Short-term (one day) locker storage is provided in the atrium of the Buell Management Building. Items removed when lockers are vacated may be claimed by calling Campus Safety, 248.204.3945.

## LOST AND FOUND

The Department of Campus Safety Services is the clearinghouse for lost and found articles. Call 248.204.3945. Campus Safety delivers all found Lawrence Tech laptop computers to the Laptop HelpDesk, 248.204.2330.

## MOTOR VEHICLES AND PARKING

All students may have motor vehicles on campus. Ample paved, lighted parking is provided free for students, faculty, staff, and visitors. Each student, faculty, or staff vehicle must display a current Lawrence Tech parking permit, which is available from the Student Service Center or Campus Safety. Lawrence Tech Campus Safety officers are authorized to levy fines on tickets issued for improper



driving or parking. Campus motor vehicle parking and traffic regulations appear in the Student Handbook. The University is not liable for accidents, damage, or theft.

## ONLINE STUDENT SERVICES

Lawrence Tech offers a variety of convenient online student services. Students can register for courses, view their academic records, make tuition payments and conduct financial aid transactions through my.ltu.edu BannerWeb from any location at any time.

Students may register online using their nine-digit Student ID number and their PIN. In addition, undergraduate students in the Colleges of Arts and Sciences and Engineering need to obtain an Alternate PIN from their academic advisor. The Alternate PIN is the advisor's electronic signature, giving the student approval to register. Students owing a balance from previous semesters may not register.

Students may also view and print an unofficial copy of their student transcript, provided they do not have a hold that prohibits this function (such as owing the University money).

## OPEN DOOR POLICY

The president's door is always open to students. Concerns and issues normally can be resolved in consultation with instructors, department chairs, college deans, dean of students, provost, or other responsible administrative offices. If not, students may contact the

president's executive assistant, who will prepare a briefing and arrange a convenient appointment between the student and the president.

## POSTAL AND PACKAGE SERVICES

Mailboxes for outgoing mail are located in the lobby of the Engineering, Buell Management, and Science Buildings, as well as at the Welcome Center in the University Technology and Learning Center, and at the Information Desks at both residence halls.

Stamps may be purchased at the Information Desks in both residence halls. All mail and packages are delivered to the Information Desks.

United Parcel Service (UPS) has an outbound package kiosk located outside the Buell Management Building on the atrium level at the north (C-lot) side of the building.

## SAFETY AND SECURITY

A safety team patrols Lawrence Tech 24 hours a day. But because no metropolitan area is immune from criminal activity, all students should take an active role in assuring personal safety.

Report suspicious persons or activities immediately to the Department of Campus Safety (available 24 hours a day) by dialing ext. 3945 (or 248.204.3945). For emergencies, dial \*911 (Star-9-1-1) to be connected to Campus Safety, which will contact the appropriate emergency service. From campus pay phones, dial 911 for municipal police, fire, or medical emergencies.

Lawrence Technological University, in full compliance with the Federal Crime Awareness and Campus Security Act of 1990, makes security information available to Lawrence Tech's students, faculty and staff, as well as

admissions applicants, newly hired employees, and the public. Statistics on campus crime may be examined at the Department of Campus Safety. Campus safety and security statistics for the prior academic year are available at [www.ltu.edu](http://www.ltu.edu).

## STUDENT AFFAIRS

The Division of Student Affairs coordinates efforts, programs, and services that support the development of a vibrant learning community on campus. The division's purpose is to support students, staff, and faculty in achieving the educational mission of Lawrence Tech by creating communities that foster and support student growth and development. Offices included in the Division are: the Academic Achievement Center; Campus Safety and Mail Services; Career Services; University



Counseling; Disability Support Services; Dining Services; Student Activities and Recreation; University Housing; and the Welcome Center (campus switchboard). The Office of the Dean of Students serves as the central resource for activities coordinated by the Division of Student Affairs. Events, programs, and services provided through these offices are designed to enhance student involvement and student leadership development.

## STUDENT COMMUNICATIONS/ EMAIL

All students are required to obtain and maintain University computer accounts while they are enrolled at Lawrence Tech. These accounts are provided without additional charge to registered students. Students may access these accounts while on campus with laptops or personal computers. They may also be accessed from off-campus via personal Internet accounts. Students may also communicate directly with faculty, staff, and administrators through email. Because email is considered a formal channel of communication for official University correspondence, students are expected to review their email on a regular basis.

## STUDENT HOUSING

University Housing at Lawrence Tech provides more than just a room in which to sleep and study. University Housing staff members are committed to assisting residents in all aspects of their collegiate experience by providing a safe and healthy envi-

ronment, promoting the ideals of community living by emphasizing personal responsibility and respect for others, creating opportunities for student involvement and personal development, and offering advice and information to residents.

Students interested in on-campus housing should complete a Housing Application and Contract and pay the application fee. Applications are available from both the Office of University Housing and Admissions Office. For more information, see the Student Housing section of this Catalog or contact the Office of University Housing, 248.204.3940.

## STUDENT INSURANCE

A 12-month health and accident insurance policy is available to all full-time students at a reasonable cost. Contact the Student Service Center or the Office of the Dean of Students for additional information.

Lawrence Technological University advises all students living in the residence halls to obtain personal property insurance (also known as renter's insurance). Many students may have their personal property covered under their parents' homeowner's insurance policy; check with the insurance provider to determine applicable coverage. Personal property insurance for those students who are not covered by their parents' homeowner's policy or for students seeking additional coverage is available through National Student Services, Inc. For additional information, visit their website at [www.nssinc.com](http://www.nssinc.com) or contact the Office of University Housing.

## STUDENT LOUNGES

A student lounge with fireplace is located in the Engineering Building. Another is on the lower level of the Architecture Building. The LarryJoe, a coffee kiosk and lounge, hosted by Dining Services, is located in the atrium of the Buell Management Building.

## STUDENT RECORDS

Students may view their academic transcripts, account information, and other student-related information online through BannerWeb at <http://my.ltu.edu/>. Student records are confidential and access to information requires the student's Banner ID number (excluding the initials) and PIN.

## STUDENT SERVICE CENTER

The Student Service Center, located in the Engineering Building, assists students with records and registration, financial aid, and student accounting transactions. The center is open Monday and Tuesday, 8 a.m.-7 p.m., and Wednesday-Friday, 8 a.m.-4:30 p.m. The Center moves to the Taubman Center early in 2006.

## STUDENTS WITH DISABILITIES

The Division of Student Affairs, 248.204.4100, and the Academic Achievement Center, 248.204.4120, coordinate Lawrence Tech's compliance with Sections 503 and 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act.

The University does not discriminate against students with disabilities in recruitment, admission, or treatment after admission. In addition, the University makes reasonable accommodations to permit students with disabilities to fulfill academic requirements and provides effective auxiliary aids to ensure that they are not excluded from programs because of their disabilities.

Eligibility for accommodations is determined on an individual basis. For additional information on eligibility for services, accommodations, and student responsibilities, refer to Lawrence Tech's website or contact the disability services coordinator at 248.204.4120 or (TDD) 248.204.4117 to schedule an appointment. Students who believe that the University may not be meeting these responsibilities or who believe that they have been otherwise discriminated against based upon their disability may contact the Section 504 officer at the Division of Student Affairs, 21000 W. Ten Mile Rd., Southfield, MI 48075-1058.

## VETERANS

Questions regarding benefits under the GI Bill, Michigan National Guard educational benefits, or any funding related to veterans should be directed to Lawrence Tech's Office of Financial Aid and Veterans Affairs. See the Financial Aid section of this *Catalog*.

# ACTIVITIES AND ORGANIZATIONS



**T**he need for new friends and new interests may be fulfilled, in part, by becoming involved in one or more of the activities, clubs, or professional organizations on campus. Fellowship, leadership opportunities, fun, and rewarding experiences come from such memberships. Combined with the formal education on campus, these organizations help students prepare for the challenges of tomorrow.

Students are encouraged to become active early in their collegiate careers and continue their activities throughout their years at Lawrence Tech. Faculty and staff members advise the clubs and organizations, and the Office of Marketing and Public Affairs offers help with publicity and reports news of activities on-

campus and to the media.

To be eligible to run for office in any campus organization, students must have a cumulative grade point average of at least 2.0. They will be requested to withdraw from office at the end of any semester in which their semester grade point average falls below 1.8. In order to hold a Student Government office, a student must maintain at least a 2.3 grade point average. Students interested in forming new organizations should contact the director of Student Activities or Student Government president for assistance and for membership in the Student Government, whose approval is necessary for official recognition and funding assistance.

## PROFESSIONAL AND STUDENT ORGANIZATIONS

**Student Government** – The Lawrence Tech Student Government is recognized by the University administration as the official representative for the entire student body. It offers the opportunity for students to better themselves and their University through involvement in campus activities. Every student is extended an invitation to attend the many campus activities spon-

sored and supported by the Student Government. Student Government business is conducted twice monthly. All interested students are encouraged to attend meetings and express their views. Contact the Student Government through the Office of Student Activities and Recreation. The Student Government actively endorses all Lawrence Tech clubs and organizations that are beneficial to personal and scholastic achievement.

The Student Government is composed of three interacting branches working in cooperation with each other. They are the Student Administration, the Student Senate, and various committees. The Student Administration consists of a president, vice president, and treasurer, who are elected in a spring campus-wide election. A secretary and various committee chairmen are appointed by the president and approved by the Senate. Students become eligible to be members of a Student Government committee by simply attending the meetings. Members of the Student Senate include official representatives from each rec-





# ACTIVITIES AND ORGANIZATIONS

ognized club and organization and three appointed senators-at-large. Senators are the only voting members at Student Government meetings. All business concerning the Student Government is brought before the Student Senate for approval. The Student Government recognizes five standing committees: Technology Committee, Blood Drive Committee, Scholarship Committee, Social Committee, and Charity Committee

## Professional Organizations –

Alternative Energy Student Group (AESG)  
 American Chemical Society (ACS)  
 American Institute of Architecture Students (AIAS)  
 American Society of Civil Engineers (ASCE)  
 American Society of Interior Designers (ASID)  
 American Society of Mechanical Engineers (ASME)  
 Associated General Contractors of America (AGC)  
 Association for Computing Machinery (ACM)  
 The Engineering Society of Detroit (ESD)  
 Institute of Electrical and Electronic Engineers (IEEE)  
 Michigan Society of Professional Engineers (MSPE)  
 National Society of Black Engineers (NSBE)  
 Society of Automotive Engineers (SAE)  
 Society of Physics Students  
 Society of Women Engineers (SWE)



## Honor Societies –

Chi Epsilon  
 Eta Kappa Nu (Theta Upsilon Chapter)  
 Lambda Iota Tau and Tau Iota Pi Tau Sigma (Phi Iota Chapter)  
 Sigma Pi Sigma  
 Tau Beta Pi (Michigan Eta Chapter)  
 Tau Sigma Delta

## Clubs and Publications –

Anime Group (LAG)  
 Artists' Guild  
 Campus Crusade for Christ Collegiate Entrepreneurs' Organization (CEO)  
 Computer Gaming Club  
 Detroit Metropolitan High School Mathematics and Computer Club (DMHSMC2)  
 Math Club  
 Musicians' Society  
 Prism  
 Ski and Snowboarding Club  
 Students Planning Activities Monthly (S.P.A.M.)  
 Student Alumni Council  
 Tech News  
 Wireless Society

Delta Phi Epsilon  
 Delta Tau Sigma  
 Phi Beta Sigma Fraternity, Inc.  
 Phi Kappa Upsilon  
 Sigma Phi Epsilon  
 Sigma Pi  
 Theta Tau

## ATHLETICS AND INTRAMURALS

**Intramurals** – Intramural sports, which are free to all students, include football, softball, basketball, indoor soccer, racquetball, wallyball, and volleyball. Rock climbing, skiing and snowboarding, golf scrambles, a 5K run, paintball, and other outings are sponsored by the Student Activities and Recreation Office. Any group of students is welcome to form teams and submit the names to the Student Activities Office for scheduling of games.

**Club Sports** – Club sports allow Lawrence Tech students to compete with clubs and varsity teams from other colleges and universities. Soccer and ice hockey are currently offered and other sports are possible if student interest is sufficient to field teams.

## GREEK LIFE

**Interfraternal Council** – This organization provides coordination and improves communication among the various Greek-letter social organizations on campus.

**Greek Letter Organizations** –  
 Alpha Kappa Alpha Sorority, Inc.  
 Alpha Sigma Phi  
 Chi Omega Rho



# STUDENT HOUSING



**I**t is a fact that most students who initiate their university experiences by living on campus will progress further in their course work and be more successful. When students are successful in the classroom and have support outside the classroom, their university experience will not only be memorable but can also play a valuable part in life after graduation. The living and learning environment that is fostered within University Housing supports students' academic, social, cultural, and personal goals.

The camaraderie that develops among residents is unequalled by any other living option. Residents who take advantage of this environment tend to improve both their academic performance and their satisfaction with their college experience. Each residence hall community offers oppor-

tunities for students to get involved in numerous activities and programs.

Lawrence Tech focuses on creating an environment that develops the "whole person." Two modern, apartment-style residence halls accommodate more than 600 students on campus. Campus living is more than just convenient -- it's a terrific way to take advantage of the full range of academic, social, and other opportunities that are an

important part of your university experience.

Each of Lawrence Tech's residence halls feature both one- and two-bedroom fully-furnished suites that include full kitchens, full baths, living and eating spaces, and many other amenities. The \$12 million University Housing-North, opened in 2002 near the campus center, contains four floors of suites anchored by central community rooms. University Housing-South,

opened in 1977 has undergone some \$3.1 million in refurbishing, including new paint and carpeting. It contains nine floors of suites overlooking the south campus and a nature preserve/wetland.

In addition to the University Housing professional staff member in each building who can assist you with your residential needs, there are community leaders who are upper class students who plan activities for residents and who "know the ropes" about campus resources, personnel, and other attributes that can maximize your Lawrence Tech experience. On the first year experience floors, there are also resident mentors who serve as role models and provide academically focused programs. Each building has a community assistant that coordinates various social and educational opportunities for the residents.





Several neighborhood shopping centers are located nearby, as are restaurants, banks, gasoline stations, dry cleaners, and other services. Two regional shopping malls are within a five-minute drive and the entire metropolitan area is easily accessible via the nearby Lodge (M-10) and I-696 freeways. Taxis and limited bus service serves the area. The recreational facilities of Lawrence Tech's Don Ridler Field House and outdoor playing fields are only a short walk or bike ride away. The recreational facilities of the nearby Southfield Civic Center are available to campus residents and include tennis courts, handball courts, a nine-hole golf course, Olympic-size pool and indoor ice rink.

### University Housing-North

- Offers 68 one- or two-bedroom fully furnished suites;
- Full bathroom with a bathtub/shower for each bedroom;
- Full kitchen in each suite with a stove, refrigerator, microwave, dishwasher, and garbage disposal;
- Washer and dryer in each suite;

- Wireless and wired connectivity in each suite;
- 24-hour security with card access;
- Cable and utilities included;
- Free adjacent parking

### University Housing-South

- Offers 123 one- or two-bedroom fully furnished suites, many with balconies;
- Full bathroom with bathtub/shower for each suite;
- Full kitchen in each suite with stove, refrigerator;
- Washers and dryers in common facilities;
- Wireless connectivity in each suite;
- 24-hour security with card access;
- Cable and utilities included;
- Refurbished lounge areas;
- Fresh carpeting;
- Free adjacent parking

For tours, rates, and other information about Lawrence Tech's residential options, contact the Office of University Housing at 248.204.3940.



### OTHER HOUSING

The Southfield and northern metropolitan area abounds with a variety of privately owned rental housing, ranging from rooms, small homes or duplexes available from individuals, to large complexes containing hundreds of units. Most require 12-month leases.

### RENTER'S INSURANCE

Students residing in University Housing, or in locations other than their family home, are advised to secure tenant's insurance on their personal belongings and furnishings to protect against loss, theft, or damage.





**“All the worthwhile and precious things in life are only obtained through continuous and exacting effort, and their worth is in direct proportion to the effort put forth for their attainment.”**

*Russell E. Lawrence  
1889-1934*

**I**t was a firm belief in the future that motivated Russell E. Lawrence to found a university in 1932 -- in the midst of the economic chaos of the Great Depression. While less farsighted individuals made predictions of gloom, Russell Lawrence and his brother, E. George Lawrence (who led Lawrence Tech during its formative years from 1934 to 1964), turned a dream of preparing students for leadership in the new technological era into reality.

Over nearly 75 years, Lawrence Tech has continued to prosper and accelerate its growth, hone its educational philosophy of theory and practice, build important community and professional alliances, and forge partnerships with the firms, organizations, and industries who hire Lawrence Tech alumni.

Lawrence Tech was founded on the principle that every

person should have the opportunity for a college education. There were no restrictions on entering students relating to race, sex, color, creed or national or ethnic origin -- only the requirement that students qualify for admission and have the desire to succeed. Working students could earn a baccalaureate degree by attending evening programs, day programs, or a combina-

tion of the two -- a feature unique in 1932 and still remarkable today.

Wayne H. Buell, an alumnus and former industry executive who served as president 1964-77, and as chairman of the board and CEO until 1981, worked to build a firm foundation for the University's early emergence as a technological leader. He first advanced the notion that Lawrence Tech was



“a private university serving public purposes.”

Several new buildings, the return of graduate degrees, and massive growth of computer facilities marked the presidency of Richard E. Marburger, a research physicist and educator who served as president from 1977 to 1993 and also served as chairman of the board of trustees and chief executive officer from 1981 to 1993.

Charles M. Chambers, a physicist, attorney, and seasoned university teacher and administrator, was named president and chief executive officer on July 1, 1993. He has led significant enhancement of the University's reputation as a distinguished center of technological education and research, through such efforts as the Pacific Rim scholars program, the national alumni service campaign, and the minority careers development initiative. A Campus Master Plan and Strategic Plan have been adopted to guide the University well into the new century, and achievements to date include construction of the A. Alfred Taubman Student Service Center, the University Technology and Learning Center, University Housing-North, and the Center for Innovative Materials Research; establishment of a Faculty Senate; conversion of the computer system to a client server model with full Internet2 connectivity and online library; development as Michigan's first wireless laptop campus; redevelopment of the Academic Quadrangle; growth of academic programs including the launch of doctoral programs; and numerous other expansions and improvements.

The school was originally



called Lawrence Institute of Technology. Its present name, Lawrence Technological University, was approved by the State of Michigan on January 1, 1989, and more clearly describes Lawrence Tech's undergraduate and graduate mission.

Lawrence Tech was founded as a college of engineering with only a few hundred students and a handful of faculty. Today over 60 programs are offered in four colleges with a total enrollment of nearly 5,000 students and employing over 300 full- or part-time faculty. In terms of enrollment,

Lawrence Tech is among Michigan's largest independent colleges.

In 1950, associate programs were added to Lawrence Tech's baccalaureate offerings. In 1952 the College of Management was added, having its origins in an earlier industrial engineering curriculum. Master's programs in management were launched in 1989. The College of Architecture and Design evolved in 1962 from the former architectural engineering department, and in 1993 instituted an M.Arch. program. The College of Arts and

Sciences was established in 1967; master's programs in engineering were begun in 1990 and in Arts and Sciences in 1997. Doctoral degrees were first offered in 2002.

Concurrently, there has been an enormous expansion and improvement of facilities. The University's first home was in Highland Park, adjacent to the huge manufacturing facility where Henry Ford perfected the moving assembly line. Burgeoning enrollment led the University to acquire acreage for expansion, and in 1955 the first building opened in Southfield on what had been a General Mills research farm. As the surrounding region has evolved into one of the world's great centers of technology and commerce, Lawrence Tech's campus has grown to over 120 acres and 11 major buildings, as well as the Frank Lloyd Wright-designed "Affleck House" in Bloomfield Hills, donated to the University in 1978. Learning centers have also been established at other sites in Michigan and with partner institutions in Canada, Mexico, and Asia.





**T**he University has a selective admissions process -- the objective of which is to identify men and women who have the highest potential for advancement in their chosen field of study. While the applicant's academic record is a reliable measure for the prediction of academic success, the admissions decision is more complex than admitting students on the basis of a numerical formula. With this intent, Lawrence Tech considers, in addition to the applicant's previous academic record, factors which demonstrate an aptitude for successful study.

For the admissions requirements for any of Lawrence Tech's graduate degree programs, see the *Graduate Catalog*.

## FRESHMAN ADMISSION REQUIREMENTS (Undergraduate Programs)

1. A completed application for admission with the non-refundable fee and official high school transcripts. If the student is attending high school when accepted to Lawrence Tech, the student must make arrangements to have a final official copy of the transcript sent to the Lawrence Tech Office of Admissions upon graduation;
2. A high school diploma or GED equivalent;
3. Generally, a recomputed overall GPA of 2.50 or better in academic subjects and a 2.00 GPA or better in individual subjects that pertain to the desired program of study. Academic subjects include language and literature, social sciences, mathematics and natural sciences. Admission into associate degree programs requires a GPA of 2.00 or better in individual academic subjects and an overall GPA of at least 2.00. Advanced placement and honors courses taken in high school are given special consideration;
4. An official copy of American College Test (ACT) or Standard Achievement Test (SAT) scores. Scores should be sent to Lawrence Tech, school code 2020.

## PLACEMENT EXAMINATIONS

All entering freshmen must take placement examinations appropriate for their majors. Examination topics include mathematics, English, chemistry, physics, and computer literacy.

New transfer students are required to take placement exams in areas in which they do not have transfer credit. If the transfer student has been placed into a course already

completed successfully elsewhere, the results of the placement exams are for advising only. Past experience has shown that students who ignore placement results perform poorly in classes for which they are not prepared.

Placement exams are given prior to attending the Orientation and Registration program. Information concerning placement exams will be sent to those students needing the exams upon acceptance into the University. For further information about the exams, contact the Office of Admissions, 800.CALL.LTU, ext. 1.

## PREREQUISITES (Basic Studies)

High school graduates and transfer students who meet admissions requirements but lack adequate proficiency in courses basic to their chosen degree may be admitted subject to the satisfactory completion of appropriate Basic Studies courses. College-level courses in intermediate algebra/geometry, college algebra, trigonometry, chemistry, physics, and English are available for this purpose. These courses do not provide credit toward most degree programs offered at Lawrence Tech. A student's enrollment in certain courses is restricted until Basic Studies courses have been satisfactorily completed.



## TRANSFER ADMISSION REQUIREMENTS

1. A completed application for admission and non-refundable fee;
2. Official transcripts sent from each institution to Lawrence Tech's Office of Admissions, including high school transcript;
3. A minimum GPA as follows:
  - a) Students with 30 or more semester hours completed at another institution are required to have a minimum of a 2.00 GPA;
  - b) Students with less than 30 hours completed at another institution must also submit official high school transcripts and meet the freshman requirements listed above;
  - c) Students applying for admission to the Bachelor of Science in engineering technology must have completed an associate degree that has been approved by the Department of Engineering Technology. A minimum 2.00 GPA and successful completion of all necessary prerequisite course work is required;

Lawrence Tech has entered into agreements with several area community colleges that establish in advance which community college courses may be applied toward a Lawrence Tech degree. Lawrence Tech will grant admission to students who complete the specified community college associate degree program and will award the prescribed degree to students who complete the

Lawrence Tech courses listed in such an agreement and who otherwise meet graduation requirements.

Transfer students pursuing a baccalaureate degree are expected to complete a minimum of 60 hours of junior- and senior-level course work, a minimum of 30 hours of which must be taken at Lawrence Tech.

**Undergraduate Transfer Credit Procedure** – The University will accept all courses with a grade of 2.00 or better from a completed General Education program of an approved four-year college or from a community college associate degree program designed for transfer to a four-year institution. Approved colleges include regionally accredited community colleges and four-year colleges and institutions, as well as others approved by Lawrence Tech. Such students will be expected to have demonstrated competencies in the following categories:

- a) communications beyond English composition
- b) knowledge of the humanities
- c) knowledge of the social sciences
- d) mathematics, including calculus
- e) science, including a laboratory science

If the total number of semester hours in each category of competency is less than the total required by Lawrence Tech, the student will take additional General Education courses at Lawrence Tech to fulfill the requirement.

All Lawrence Tech students, including those certified to have met General Education requirements elsewhere, must complete an upper division course in language and literature or social science as part of their bachelor's degree program. In those cases where a General Education course is required as a prerequisite for courses in the major, the prerequisite must be completed even if the General Education requirement is otherwise met. The accreditation specifications of a particular professional degree may require students to complete additional depth and breadth course work in General Education.

Transfer students who enter Lawrence Tech without General Education Requirements completed will be required to complete the Lawrence Tech General Education requirement as established for their degree program. In this regard, individual General Education courses taken elsewhere will be considered for substitution for Lawrence Tech courses.

Transfer students will have their official transcripts evaluated and receive a Credit

Evaluation prior to their enrollment. The Credit Evaluation lists all courses required for a specific degree program in accordance with guidelines provided by the major college and the College of Arts and Sciences for the General Education component. All courses listed are required unless transfer credit has been granted or if the student has been excused. If excused from a course, an "EX" will appear in the Credit Hours Transferred column and the student must complete the same number of credit hours in another course acceptable to his or her academic advisor.

If courses are in progress at the time of acceptance, students must request that a complete and official transcript be sent to the Lawrence Tech Office of Admissions and ask that their academic advisor evaluate such courses during the first semester of enrollment.

**Additional Transfer Credit** – All transfer credits are subject to review by the department chairman or dean of the pertinent College. Questions con-





cerning credit evaluations must be resolved by the Office of Admissions within the first semester of enrollment. Any appeal for additional credit must be requested to the Registrar for review by the Credit Review Committee.

**ROTC/Military Transfer Credit** – Credit earned in the Reserve Officers Training Corp and credit for military training may be applied toward degree work in several Lawrence Tech programs, and will be considered according to the recommendations of the American Council on Education. Contact the Office of Admissions for additional information.

**Other Forms of Additional Transfer Credit** – High school students may earn credit with satisfactory results on Advanced Placement Examinations (AP).

Credit may also be obtained through the College Level Examination Program (CLEP) for subject examinations only. CLEP information is available

through local libraries and the Office of Admissions.

Courses offered by non-collegiate organizations will be considered for credit only if they have received credit recommendation from the National Program on Non-Collegiate Sponsored Instruction (National PONSI). Transfer credit will be considered on an individual basis. In all cases, students are required to demonstrate that they had the appropriate academic preparation for the non-collegiate course at the time it was taken.

No more than 30 semester hours of credit will be accepted from the sources listed above. A request for credit from these sources must be resolved with the Office of Admissions within the first semester of enrollment. Credit for PONSI and military courses will not be shown on the students' transcript until all

other requirements for the degree have been met. Students will not receive credit from the above sources if the work is carried out while they are enrolled at Lawrence Tech or during the summer between terms of enrollment. Any exceptions will require prior written permission of the Credit Review Committee.

## ADMISSION TO GRADUATE PROGRAMS

For information on any of Lawrence Tech's graduate programs, see the *Graduate Catalog*.

## GUEST STUDENT ADMISSION REQUIREMENTS

1. A completed Michigan Uniform Guest Application from the Michigan institution in which the student is enrolled which specifies the courses to be taken and includes the approval and official seal of the academic advisor and/or registrar.
2. A copy of the college transcript (high school transcripts or other college transcripts may be required if the prerequisite was taken at an institution other than the current one). Students not currently enrolled in collegiate programs and those who attend institutions outside of Michigan must apply as a transfer, freshman, or graduate student, or as a non-degree special student. Guest students are allowed to enroll in specific courses for which all prerequisites have been met and for one semester only. Lawrence Tech students have enrollment preference over guest students.

## NON-DEGREE SPECIAL STUDENTS AND CURRENT HIGH SCHOOL STUDENTS

Undergraduate students who elect to take courses but who do not wish to pursue a degree program may enroll as a special student by submitting the following to the Office of Admissions:

1. A completed application for admission (see Non-Degree Special Student section of application) and the non-refundable fee;
2. Unofficial copies of transcripts from institutions attended (high school transcripts may also be required). Non-degree student status will be granted for one semester only. A non-degree student who wishes to obtain regular admission to an undergraduate program must make a regular application to that program and meet all regular admissions requirements. Credit for courses taken while a non-degree student may be applied toward the degree if approved as part of the admissions process.

When courses taken as a non-degree student are applied toward a degree, the cumulative GPA will be computed from all undergraduate courses taken at Lawrence Tech.

High school students who wish to take classes at Lawrence Tech before graduation must have approval from

their high school principal and Lawrence Tech's Office of Admissions, and submit the following:

1. A completed application for admission and the non-refundable fee;
2. Official high school transcript;
3. A completed Lawrence Tech application supplement for high school students (request from the Lawrence Tech Office of Admissions).

## INTERNATIONAL STUDENT ADMISSION REQUIREMENTS

International students must have above average grades in their secondary and post-secondary academic course work. The following items must be submitted to the Office of Admissions at least two months before the desired semester of enrollment:

1. Completed application for admission signed by the student, and non-refundable fee in U.S. currency;
2. Certified true copies of original academic transcripts. The certified true copies of the academic transcripts must be submitted to

World Education Services (WES) for a course by course evaluation. The website [www.wes.org](http://www.wes.org) provides important information.

3. Evidence of English proficiency;
4. An Affidavit of Support (for F-1 Visa holders);
5. An F-1 transfer clearance form (for F-1 students transferring from a U.S. college or university);
6. Foreign address.

## TRANSFERS WITHIN THE UNIVERSITY/INTERRUPTION OF STUDIES

An interruption of studies occurs when a student does not attend classes for a full semester or more without special permission. Readmission is not automatic; admission policies and academic programs in place at the time of readmission will apply.

Students who have interrupted their studies for more than three calendar years must submit a new application to the Admissions office and will be subject to the curricula and requirements of the chosen program upon their return.

Students may reapply through the Office of the Registrar under the following conditions:

1. returning within three calendar years;
2. academically eligible to return;
3. returning to an undergraduate degree program.

Students must reapply through the Office of Admissions, and pay the application fee, under the following conditions:

1. returning after more than three calendar years;
2. beginning a new degree program after graduation from Lawrence Tech;
3. academically ineligible to return (suspended, dismissed); in this case the student must also seek readmission from the Academic Standing Committee.

## CHANGE OF MAJORS

Currently enrolled students desiring to change majors within their College (example: mechanical engineering to electrical engineering) do not need to reapply for admission. Students should contact the dean of their College and submit the appropriate change of curriculum form to the Office of the Registrar.

## RETURNING ALUMNI

Lawrence Tech alumni may enroll in courses for which prerequisites have been met without reapplying for admission. If another degree is desired, alumni must submit a completed application for admission and the non-refundable fee to the Office of

Admissions and must meet normal admission requirements. The fee is waived for graduates applying to a master's program.

## ADMISSIONS ADVISING AND TOURS

The Office of Admissions is open year-round (except holidays). Admissions counselors are available on a walk-in basis on weekdays. Students are encouraged to contact the Office of Admissions with any questions, if they require additional information, if they would like to schedule a tour of the campus, or if they wish to observe classes, call 248.204.3160 or 800.CALL.LTU. Visit Lawrence Tech on the Web at [www.ltu.edu](http://www.ltu.edu).

## NON-DISCRIMINATORY POLICY

Lawrence Technological University adheres and conforms to all federal, state, and local civil rights regulations, statutes, and ordinances. No person, student, faculty or staff member will knowingly be discriminated against relative to the above statutes. Lawrence Technological University is an equal opportunity employer.

Direct inquiries regarding non-discriminatory policies to: Division of Student Affairs, 21000 West Ten Mile Road, Southfield, MI 48075-1058; 248.204.4100.







**L**awrence Technological University sets tuition rates with the one goal of providing students with the best possible learning experience. The emphasis is on quality. Concurrently, the University has a long tradition of prudent management that has allowed it to contain costs and provide students with extraordinary value for their tuition investment, but never at the expense of Lawrence Tech's primary emphasis.

Tuition at Lawrence Technological University is used to cover many of the costs associated with a student's learning experience. Remaining expenses are funded through support from the University's alumni and friends, including gifts from individuals, corporations, and foundations.

Tuition and fees are normally established on an annual basis. However, the University reserves the right to make changes in these charges or to initiate or delete charges without notice. The schedule of current tuition and fees is published separately from this Catalog and is available from Lawrence Tech's Offices of Admissions, Business Services, or Registrar.

## PAYMENT OF TUITION AND FEES

Tuition and fees are due in full at the time of registration. If full payment cannot be made at the time of registration, the following options are available:

1. Enroll in Tuition Management Systems – a monthly payment;
2. Provide Billing Authorization Forms (Tuition Vouchers) when the student's employer is to be invoiced by the University;
3. Apply for student financial aid, granted on estimated eligibility. The student will be fully responsible for any charges that are not covered by financial aid.

The options stated above are available only when all prior balances have been paid in

full. Monthly late charges will be assessed on all accounts with past due balances. Transcripts, diplomas, and/or permission to register will not be issued if an outstanding balance appears on a student's account.

## METHOD OF PAYMENT

Students can make payments on their accounts using any of the following methods:

1. At the Student Service Center by cash, check, money order, or credit card;
2. By mailing a check, money order or appropriate credit card information;
3. By phone or faxing appropriate credit card information to Business Services;
4. Charging against a credit card via BannerWeb at [my.ltu.edu](http://my.ltu.edu);
5. Via the Drop Box located outside of the Student Service Center.

## COSTS FOR WITHDRAWAL

Costs for withdrawal are established as stipulated by federal regulations. The date when credit for withdrawal will be received can be obtained from the Office of the Registrar.

A full tuition refund will be granted for all drops completed within the Drop/Add period. Official Drop/Add period dates for each semester are available from the Office of the Registrar, on BannerWeb at [my.ltu.edu](http://my.ltu.edu), as well as on the Lawrence Tech website. After the Drop/Add period, no refunds are provided. Registration fees, activity fees, graduation fees, and course

fees are non-refundable and are not included in the withdrawal credit calculation. Balances remaining after the drop adjustments must be paid based upon the University policy for payment of tuition and fees. Credit balances will be refunded.

The semester begins on the first day of classes as listed in this University Catalog, unless otherwise indicated.

Date of withdrawal is the date the student's drop form is validated by the Office of the Registrar, the postmark date of the letter of withdrawal, or the date the student completes the withdrawal on BannerWeb at [my.ltu.edu](http://my.ltu.edu).



## STUDENT TUITION APPEAL PROCESS

If a student wishes to receive an exception to University policy and drop classes after the tuition refund deadline and receive a refund of any type or wishes to have the late registration or the late transaction fee waived, he/she should follow this process:

Submit the Tuition and Fee Appeal Form, along with a let-

ter to the Office of the Registrar explaining the request and the rationale for the request. All supporting documentation should be submitted at this time (e.g., medical documentation). The Appeal will not be accepted or reviewed without all information.

The Registrar will prepare a packet of information that includes the student's current semester's schedule, the

tuition statement for the current and previous semesters, a list of the student's courses and grades, and the student's financial aid status.

The Appeals Committee (composed of the registrar, dean of students, director of financial aid, director of admissions, and director of business services) reviews each student request and packet of information and makes a determination. The Committee may also contact the student's instructor(s) to inquire as to attendance record and current grade in the course. The Registrar then sends a letter to the student with the decision.

Students should be aware that if an exception is made, the amount of their financial aid may be impacted and in some circumstances they may

potentially owe the University money.

It is important to note that exceptions to University policy are made only in rare circumstances, such as a debilitating illness. Requests made because of difficult work schedules or class schedules will not be considered.





carefully all of the instructions, and return the form as indicated in the instructions. The FAFSA is available from high school counselors or on the Web. Go to [www.ltu.edu/financialaid](http://www.ltu.edu/financialaid), or [www.fafsa.ed.gov](http://www.fafsa.ed.gov).

**Deadlines** – To obtain a tuition grant for the semester beginning in the fall, students should fill out the FAFSA and return it for processing in early spring. The final deadline is July 15. Students are encouraged to file early in order to know their financial aid status well in advance of the fall semester.

All students should complete the FAFSA prior to March 1st for Michigan Competitive Scholarship consideration.

**H**elping both new students and upperclassmen with their financial planning is the role of Lawrence Tech's Office of Financial Aid. Approximately two-thirds of the University's students receive financial assistance. Financial assistance totals more than \$25 million annually – \$10 million in outright grants and scholarships, and \$15 million in low-interest loans.

Through various private, state, and federal programs, the Office of Financial Aid offers aid to some 3,000 students. Good students should not be dissuaded from pursuing a quality Lawrence Tech education because they assume it is beyond their means.

## STATE TUITION GRANTS AND SCHOLARSHIPS FOR MICHIGAN RESIDENTS

Lawrence Tech students in need of financial aid have a special opportunity for assistance through the State of Michigan Tuition Grant program, which is exclusively for students attending Michigan independent colleges. Lawrence Tech students may receive outright grants of \$100 to \$2,000 toward yearly tuition throughout their undergraduate college careers, the amount depending upon need and availability of funds.

The state also has a scholarship program, the Michigan Competitive Scholarship, for students enrolled in public or private Michigan colleges. Michigan Competitive Scholarships are awarded on the basis of the American

College Test (ACT) and demonstrated financial need.

Lawrence Tech students are also eligible for state scholarships if they are Michigan residents. Last year more than 1,500 students received Michigan scholarships or tuition grants.

**Requirements** – To qualify for a Michigan tuition grant or scholarship, an applicant must be a U.S. citizen or have declared his or her intention of becoming a citizen; must have been a continuous Michigan resident since July 1 (last year); and must be student attending at least half-time (minimum of 6 hours).

**How to Apply** – To apply, a student should complete a Free Application for Federal Student Aid (FAFSA), reading

## OTHER MICHIGAN PROGRAMS

**Michigan Adult Part-Time Grant** -- Eligible students must be self-supporting and independent, taking between 3 and 11 credit hours, and qualify for either the Pell Grant or State of Michigan Tuition Grant. Students must also be making satisfactory academic progress and have been a Michigan resident for the past 12 months. Awards range from \$100 to \$600 per year.

**Michigan Work Study** – This program is designed to help students pay for their education by providing them with employment. Students may work on campus in any capacity, including work in academic departments and administrative offices as well as library work, landscaping, and maintenance work. A student must



demonstrate financial need to be eligible for the Michigan Work Study program. MWS students earn the federal minimum wage.

## LAWRENCE TECH ACADEMIC SCHOLARSHIPS

Completion of the financial aid application process is a requirement for all Lawrence Tech scholarships and grants.

**Lawrence Tech Scholarships** – Lawrence Technological University annually offers 30 scholarships to first-time students who are high school graduates with a GPA of 3.50 or better. Financial need is not a requirement. Applications, available from the Office of Financial Aid, must be received by March 1 for scholarships beginning the following fall.

All applicants must be enrolled for at least 12 credit hours per semester and must submit scores from the ACT examination.

Each Lawrence Tech scholarship is for tuition reimbursement up to \$12,000 for each of four years, and is renewable at the discretion of the Scholarship Committee with a 3.0 GPA. Five of the 30 scholarships are available to qualified transfer students from community colleges. The remainder are awarded to high school graduates.

**University Honor Scholarships** – Lawrence Technological University annually awards more than 60 University Honor Scholarships for \$8,000 per year to first-time students who qualify with a GPA of 3.50 or better and an

ACT composite of 24 or higher. The scholarship is renewable up to three years if the student maintains a 2.7 cumulative GPA or better.

Transfer students are also eligible for University Honor Scholarships, and must transfer a minimum of 24 hours with a GPA of 3.00 or better to qualify. The award is a \$8,000 scholarship and is given for eight semesters if the student maintains a full-time student status and a GPA of 2.7 or better while a student at Lawrence Tech.

**Lawrence Tech Trustee Scholarships** – Lawrence Tech annually awards an unlimited number of Trustee Scholarships to first-time students who have a GPA of 3.00 or better and an ACT composite of 24 or higher. The scholarship is renewable up to three years if the student maintains a cumulative GPA of 2.7 or better.

Transfer students are also eligible for Trustee Scholarships, and must transfer a minimum of 24 hours with a GPA of 3.00 or better to qualify. The award is a \$3,500 scholarship for full-time students and \$2,000 for part-time students, and is given for eight semesters if the student maintains an enrollment of at least 6 credit hours and a GPA of 2.7 or better while a student at Lawrence Tech.

## SCHOLARSHIPS FOR CONTINUING LAWRENCE TECH STUDENTS

Applications, available through the Scholarship Committee chairperson, must be received before May 15 for scholarships beginning the following fall. Recipients enrolled in baccalaureate programs must have sophomore, junior, or senior standing.

All students may be eligible for the following scholarships, which range from \$500 to \$9,000 per year.

**Alumni Legacy Grant** – A number of grants, varying in amounts, are awarded to dependents of Lawrence Tech alumni. This program is made possible by the generosity and cooperation of the Lawrence Tech Alumni Association.

**Henry J. Beam Scholarship** – Established by Henry H. Beam in memory of his father, a longtime trustee of Lawrence Tech. This scholarship, funded by Henry H. Beam and his daughter, Catherine, is awarded to an outstanding upperclassman in engineering or management and is valued at \$500 per year.

**William H. Bibbens Scholarship** – Made possible by the generosity of Elizabeth V. Bibbens in memory of William H. Bibbens, Jr. and Sr. Awarded to an incoming freshman majoring in engineering and specializing in manufacturing engineering. Based on high scholastic performance and financial need. \$9,000 awarded annually, renewable up to four years.



**Cleophas Buck Memorial Scholarship** – Established in memory of Professor Cle Buck, a longtime College of Management faculty member, through the generosity of family, friends, and past and present students. A \$1,000 scholarship for an outstanding upper-class student from the College of Management.

**Wayne H. and Vita S. Buell Scholarships** – Through a bequest from Lawrence Tech's third president and his wife, full-tuition scholarships plus a book stipend are offered to outstanding students entering the University for the first time. Candidates must be in the top five percent of their high school graduating class. Five new scholarships are available each year and awarded on a competitive basis.

**DaimlerChrysler Minority and Women Scholarship** – Through the generosity of DaimlerChrysler AG, a number of scholarships are awarded yearly to minorities and women in undergraduate programs. The amount of the scholarship will vary and applicants must have a GPA of 3.00 or better.

**Concrete Improvement Board (CIB) Endowment Scholarship** – Made possible through a generous contribution by the Concrete Improvement Board, a \$1,500 award is available for a junior or senior student with a GPA of 3.00 or better in civil engineering or architecture.



**Carl W. and Jeanne E. Cowan Scholarship** – Made possible through the generosity of Carl Cowan, BSME'40, and his wife, Jeanne. A yearly scholarship of \$1,000 each, awarded to junior or senior students, preferably in engineering, with a GPA of 3.0 or better.

**D.I.T. Endowed Scholarship** – Children and descendants of Detroit Institute of Technology alumni who have a GPA of 3.00 or better in high school are eligible to receive this scholarship. The amount of the award will vary each year.

**Ford Motor Company Scholarships** – Ford Motor Company scholarships are offered to juniors and seniors with a GPA of 3.00 or better. Awards range from \$1,000 to \$2,000. Designated for minority and women students only.

**The Oscar and Lynn Freimann Scholarship** – Through the generous bequest of the distinguished Detroit architect, Oscar Freimann, the dean of architecture may award a number of annual scholarships to architectural students, ranging in value from \$400 to \$1,700. These awards are based on scholarship as well as the student's demonstrated skills in architectural drawing.

**Berry Gordy Sr. Scholarship** – Through the generosity of the Berry Gordy Foundation, a \$1,000 scholarship is awarded annually to a minority student with a GPA of 2.7 or better.

**Myron J. Greenman Scholarship** – Made possible through the generosity of Myron J. Greenman. Awarded to an engineering student with a GPA of 3.00 or better. This \$1,500 award requires a minimum of 6 credit hours to be taken each semester.

**Hobson Memorial Scholarship** – Sponsored by the Metropolitan Detroit Construction Specification Institute in memory of Robert T. Hobson, AIA, CSI, a member and one of the educational leaders of the Detroit Chapter. Several scholarships are awarded annually to upper-class architecture students with a GPA of at least 3.00. Number and value vary each year.

**Martha Bichler Horldt Scholarship** – Made possible through the generosity of Henry and Barbara Horldt. Awarded to a sophomore, junior or senior engineering major, preferably in manufacturing. A minimum of 6 semester hours required each semester for the \$1,500-\$2,000 award. A cumulative GPA of 3.00 or better is required.

**Paul M. and Ann W. Jocham Scholarship** – Made possible through the generosity of the late Paul M. Jocham, BSIE'54, and his wife, Ann. Awarded to an engineering student with a GPA of 3.00 or better. \$1,000 awarded annually.

**Lawrence Tech Alumni Scholarship** – Initiated through a charitable contribution from an anonymous alumnus and his wife. Preference given to upperclass students with at least a GPA of 3.0. The awards range from \$1,000 to \$2,500 per year and may be renewable up to two additional years.

**Christian F. Madsen Memorial Scholarship** – Made possible through a generous contribution from the Madsen family in honor of their son, Christian, a 1960 engineering graduate. A \$1,200 scholarship awarded to an engineering student with a GPA of 3.00 or better.

**Brian Mutnick Memorial Scholarship** – Funded by the Erwin Mutnick and Gary Mutnick Families in memory of their beloved son and brother. An annual \$500 scholarship to a junior or senior architecture student with a GPA of 3.00 or better.

**Calvin and Rosemary Opperthauser Scholarship** – Made possible through a generous contribution from Calvin Opperthauser, BSEE'51, and his wife Rosemary. The \$1,300 award is given to a junior or senior engineering student with a GPA of 3.00 or better that demonstrates financial need.

**William A. Rosso Scholarship** – Made possible through a generous contribution from the William A. Rosso, BME'43, family. New freshmen entering into architecture and engineering and residing in the Royal Oak, Birmingham or Clawson school districts are eligible. The amount of the award may vary each year.

**Philip Rothwell Memorial Scholarship** – Made possible through a generous contribution in the memory of Philip Rothwell. The \$2,000 award is given to a junior or senior mechanical engineering student with a cumulative GPA of 3.50. A minimum of 6 credit hours must be taken each semester.

**S.E.M.B.O.I.A. Scholarship** – Two \$1,000 scholarships offered by the Southwestern Michigan Builders Association to junior or senior students from architecture or engineering with a GPA of 3.00 or better.

**E. Martin Tallberg and Florence L. Tallberg Scholarship** – From the estate of Florence L. Tallberg, two yearly \$800 scholarships are awarded to upperclass baccalaureate students presenting a GPA of 3.00 or better.

**Upperclassmen Scholarships** – Academic scholarships in the amount of \$2,000 are available to juniors and seniors in each of the four Colleges who demonstrate an outstanding GPA.

**Yamasaki Scholarship** – A \$1,000 scholarship awarded annually to a graduate student enrolled in the College of Architecture and Design.

**Mark and Cheryl Bill Mechanical Engineering Scholarship** – A \$2,500 scholarship awarded to a mechanical engineering student or a student in the MBA program. (Mr. Bill is an alumnus.)

**Paul F. Eisen Endowed Scholarships** – Recipients of these scholarships are sophomore, junior or seniors majoring in technical communication with a GPA of 3.00 or better. Amount of the awards vary.

**John and Margaret Fawcett Scholarship** – Preference given to first-time students who graduate from Canadian high schools. A GPA of 3.00 or better is required. Awards range from \$1,500 - \$2,000 for the freshman year only. (Mr. Fawcett is an alumnus.)

**Joe and Beverly Kado Endowed Scholarship** – A \$1,000 award given to a sophomore, junior, or senior electrical engineering student with a GPA of 3.00 or better. (Mr. Kado is an alumnus.)

**Adam Kavelman Memorial Scholarship** – A \$2,000 scholarship provided by the Kavelman family in memory of their son. The award is made to a transfer Canadian student enrolling in the College of Architecture and Design.

**Mary Ann Marcum Memorial Scholarship** – A \$1,600 scholarship provided by the Marcum family in memory of Mary Ann Marcum, an alumna and former employee of the University. The award is made each year to undergraduate students with a GPA of 3.00 or better.

**McClure Charitable Architecture Scholarships** – A one semester award of \$1,000 given to sophomore, junior or senior architecture majors with a GPA of 3.00 or better. Two awards are given each academic year.





**Phillip Nicholas AIA Scholarship** – A \$500 scholarship awarded to a student in architecture with a GPA of 3.00 or better.

**Albert and Joan O'Connor Endowed Scholarship** – An undergraduate engineering scholarship in the amount of \$1,200 awarded to a sophomore, junior or senior student having a GPA of 3.00 or better in any of the engineering majors.

**John P. Parke and June M Parke Scholarships** – A limited number of \$5,000 scholarships awarded each year to engineering undergraduates (freshman through senior years). Preference is given to students who have graduated from Howell High School and have a GPA of 3.0 or better. (Mr. Parke was an alumnus.)

**Elaine and Steven Rice Endowed Scholarships** – A \$2,700 scholarship awarded each year to an architecture major at any level of study having a GPA of 3.00 or better.

**Global Scholarship** – A limited number of scholarships ranging from \$2,500 to \$7,500 are available for qualifying engineering students studying abroad in Germany and Mexico.

## FEDERAL BENEFITS FOR VETERANS

The Veterans Affairs Department (VA) provides a wide range of benefits to veterans. Veterans should contact the VA on questions concerning eligibility. New programs for some reservists and active duty personnel eligible for benefits are available as well.

The amount of the monthly allowance for Lawrence Tech veterans is based on the number of credit hours, the number of dependents, and the specific program of qualification.

All veterans receiving GI benefits are expected to maintain satisfactory academic progress. VA regulations permit only a two-semester probation period unless there are mitigating circumstances as determined by the VA. The University will inform the VA and the student when the veteran does not meet academic standards of progress and is no longer eligible for benefits.

For additional information and details, contact the Office of Financial Aid.

## LOANS FOR STUDENTS

**Federal Subsidized Stafford Loans** – A maximum of \$2,625 for freshmen, \$3,500 for sophomores, \$5,500 for juniors and seniors, and \$8,500 for graduate students is available through the Federal Government. Students must demonstrate financial need to apply for the subsidized direct loan. The federal government pays interest on a subsidized loan while the student is in college. This is a variable interest rate loan. Repayment is postponed until after graduation. See the LTU website for further information.

**Federal Unsubsidized Stafford Loans** – (Amounts same as above.) The student pays interest on an unsubsidized loan while in college, but not the principal. Students who do not show need may apply for the unsubsidized direct loan.

**Federal PLUS Loans** – Dependent students can have their parent borrow from the PLUS Loan Program. The parent loan for undergraduate students is a variable interest loan. This is a credit worthy loan and need is not a factor. Payment begins sixty days after disbursement.

**Federal Perkins Loans** – Under this federal program, a student may borrow up to \$4,000 each year up to a total of \$20,000 for an undergraduate program. The student must show a need for financial aid as determined by a financial statement. A maximum of ten years for repayment at 5 percent per annum is required. Payment is made on a quarterly basis after a nine-month grace period.

**Lawrence Tech Emergency Loan Programs** – There are a number of loan programs available to Lawrence Tech students for emergency problems: Through the generosity of the friends and families of Theodore Rogvoy, Ralph Thetreau, Paul Durocher, Frederick Bornman, Marlene Willis Thornton Sweeting, and others, students may borrow up to \$200 per semester for books, supplies, room and board, car repairs or other emergency problems.

If the loan is repaid within 90 days, no interest is charged. After 90 days, a five percent interest is charged monthly. Contact the Office of Financial Aid for an application and additional information.

## GRANTS FOR STUDENTS

**Federal Supplementary Educational Opportunity Grants (FSEOG)** – This federal program awards grants ranging from \$100 to \$4,000 for students who demonstrate financial need. Students receiving Pell awards have first priority for FSEOG funds.

**Federal Pell Grant** – Maximum grant eligibility for each student is \$4,050 annually and is available only for undergraduate students. The application for the Pell Grant, The Free Application for Federal Student Aid (FAFSA) is used to determine the family contribution. The FAFSA is available from the Office of Financial Aid or at [www.ltu.edu/financialaid](http://www.ltu.edu/financialaid) and search for the link for FAFSA.

## WORK-STUDY

**Federal Work-Study Program** – This program is designed to help students pay for their education by providing them with employment. Students may work on campus in any capacity, including work in academic departments and administrative offices as well as library work, landscaping, and maintenance work. A student must demonstrate financial need to be eligible for the Federal Work-Study program. Federal minimum wage is paid to FWS students.

For information on the Michigan Work-Study program, see “Other Michigan Programs.”

## JOB PLACEMENT SERVICE

The Office of Career Services maintains a list of available part-time and full-time jobs with area businesses and industries. Jobs are posted in a computerized jobs program accessible via campus terminals.

## COOPERATIVE EDUCATION

The University has a formal co-op program in a variety of formats including alternating semesters, back-to-back, or a parallel system of work and school. Interested students should contact the Office of Career Services for more information.

Students in the traditional co-op program (alternating every other semester between work and school) and receiving some form of financial aid or scholarship, can receive their financial aid award once they return to campus on a full time basis.

Students on the parallel program can potentially receive financial aid during their co-op duration provided they are attending at least half-time (6 credit hours) each semester.

Students should speak with a financial aid counselor for further information regarding their scholarship, loan, or other financial aid package while on co-op.

Co-op employers include a variety of small, medium, and large organizations. Among these are Ford Motor Co., General Motors Corp., Lear Corp., the Michigan Department of Transportation, Nissan Research & Development, Denso, and Siemens.

Informally and apart from the formal co-op program, many students in all disciplines work full- or part-time while attending classes. Lawrence Tech's day and evening course offerings provide considerable flexibility to students who seek concurrent employment. While students may learn of particular job opportunities through such sources as the Office of Career Services, students are individually responsible for working out an acceptable attendance schedule with their employer.

## ADDITIONAL FINANCIAL AID INFORMATION

### **Application Procedures –**

Financial assistance at Lawrence Tech is granted without regard to an applicant's race, sex, color, age, handicap, marital status, or national or ethnic origin. The financial aid application procedure for both new and enrolled students interested in state or federal programs is as follows:

- A. Contact the Office of Financial Aid for the Free Application for Student Aid (FAFSA) to apply for federal and state financial aid programs. (This can be done using the FAFSA form or by going to [www.ltu.edu](http://www.ltu.edu) and using the link for FAFSA;
- B. Complete the form and mail it as instructed before the published application deadlines;
- C. Processing normally takes six to eight weeks. New students are notified of their financial aid awards beginning in April. Returning students are notified of their awards beginning in May.

**Basis for Awards –** Students with the greatest need, as determined by a standard federal methodology, receive first choice of financial aid monies available. Students meeting published application deadlines have preference with financial aid funds.

**Basic Costs –** Personal expenses for room, board, clothing, recreation, laundry, travel, books, and incidentals vary according to individual lifestyle. An estimate for total costs can be made by adding tuition and fees to these items. The Office of Financial Aid can assist students in arriving at these estimates.

**Satisfactory Academic Progress –** All students receiving financial aid are expected to maintain satisfactory academic progress. Undergraduate students receiving any type of financial aid must maintain a grade point average of at least 2.0 after completing the first three semesters, including summer school, or risk losing their financial aid for the next academic year.

Students are also expected to make normal progress toward graduation. Students who withdraw from more than one-third of the courses in which they have enrolled during the year (two semesters including summer school) do not meet standards of progress.

Contact the University's Office of Financial Aid for information concerning the appeal and renewal procedure when standards of progress are not met.

**Defaulted Student Loans –** Students that have defaulted on student loans, or owe a refund on a grant or owe any college tuition will not be eligible for any financial aid until the obligation is fulfilled and monies paid back to the University.

**Verification of Financial Statement Information –** Lawrence Tech reserves the right to request from its students, Federal IRS 1040, 1040A or 1040EZ income tax information for the entire family for verification of financial information. Students refusing to provide family income tax information may be denied financial aid. For families not filing a federal tax form, other types of verification will be required.

**Financial Aid and Credit Hour Reduction –** Financial aid may be reduced or canceled if a student takes less than 12 credit hours per semester. Award amounts for need-based financial aid are based on the number of credit hours attempted and a student's demonstrated financial need. Students planning to drop all or part of their classes should contact the Office of Financial Aid to discuss how this will affect their financial aid awards.

**Auditing Classes –** Students who audit classes cannot receive financial aid for the audited classes.



**T**he policies and procedures described in this Catalog determine the academic status of students enrolled in the University. Exceptions to these policies and procedures may be considered only upon a written request to the Office of the Provost. In the case of a lapse of future catalogs, the policies, procedures and curricula in this Catalog will apply to all students. For policies pertaining to graduate programs, see Lawrence Tech's Graduate Catalog.

## DEFINITION OF FULL-TIME STATUS

Classification as a part-time or full-time student is based upon the weekly academic load which the student carries. Undergraduates are considered full-time when registered for a minimum of 12 credit hours.

## GROUPING OF STUDENTS BY CLASSES

Students in undergraduate programs are classified as follows:

Semester hours	
Freshman	0-29
Sophomore	30-59
Junior	60-89
Senior	90+

## CREDIT HOUR

The University converted from a quarter credit system to a semester system, effective beginning in the fall of 1994. Work completed prior to August 1994, is recorded in standard quarter hours. Work completed after August 1994, is recorded in semester hours. Quarter hours can be converted to semester hours by multiplying the number of quarter hours by two-thirds.

## GRADING SYSTEM

A record of grade points is kept in the student's permanent record and used to determine his or her overall scholastic average. The following grades are computed in the grade point average:

### Grade Points per Credit Hour

A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D+	1.3
D	1.0
D-	0.7
F	0.0

The grades D, D+, and D- are not used in graduate programs. The following grades are not computed in the grade point average:

- W Withdrawal
- X Audit
- CR Credit
- NC No Credit
- I Incomplete
- DG Deferred Grade
- NR No Report
- TR Transfer Credit
- IP In Progress
- ZZ Transfer Courses in Progress

## RECOMPUTATION OF GRADE POINT AVERAGE

The following grades may be repeated and the grade point average recalculated at the undergraduate level: C-, D+, D, D- and F. The latest attempt must have resulted in a passing grade (D- or higher). Until that point, all grades will appear on the transcript and will be computed into the grade point average.

The recalculation of the grade point average is an automated process within the Office of the Registrar; the student is not required to submit any paperwork.

To be recomputed, the latest attempt must be the same course as the first and must be part of the University's normal course offerings. Directed study or special sections may not be used for recomputation purposes.

The University does not represent that a course will be offered within the time limits above. Courses may also be deleted from the curriculum and subsequently may not be recomputed.



When the recomputation is completed, only the credit hours and grade for the latest attempt will be reflected in the grade point average (assuming the grade received is passing). The grade for the first attempt will then be indicated as follows:

Original Grade	After Recomputation
C- C- E	(the "E" designates excluded from GPA)
D+D+E	(the "E" designates excluded from GPA)
D D E	(the "E" designates excluded from GPA)
D- D- E	(the "E" designates excluded from GPA)
F F E	(the "E" designates excluded from GPA)

Graduate students in the College of Management are eligible for a one-time recalculation.

## INCOMPLETE

A grade of "I" is given only under extraordinary circumstances for course work that has been of satisfactory quality

and, in the judgment of the instructor and the instructor's dean, adequate to justify a reasonable extension of time. It is assigned only in cases in which the student has completed satisfactorily the major portion of the course requirements. Students receiving an "I" may not attend the class during a succeeding semester, unless they register for the class. Instructors must change an "I" to a grade other than "W" no later than one calendar year following the end of the semester. After one year, if course requirements are not met, the "I" will be converted to "F."

## GRADE CHANGES

The electronic entry of grades submitted by instructors at the end of each semester is the official record of grades. Grade changes, when necessary, are done by the instructor with approval of the department chairman and dean. The registrar may determine that the provost's approval is also

required in exceptional or unusual circumstances.

Any disputes concerning grades must be resolved within one semester after the course was completed.

## AUDITING CLASSES

Anyone wishing to audit a course must submit an audit request form along with the regular registration forms. These forms are available in the Office of the Registrar. No credit is granted for courses that are audited. Starting with the first day of classes, a student may not change enrollment status from audit to credit or from credit to audit. Full tuition will be charged and the tuition credit policy applies if the student withdraws.

## WITHDRAWAL FROM CLASSES

When intending to drop a course or courses or withdraw from courses, it is the student's responsibility to notify the Office of the Registrar in writ-

ing or by dropping courses online through [my.ltu.edu](http://my.ltu.edu) BannerWeb. Drop/Add forms can be obtained from the Office of the Registrar or online. The date of the drop or withdrawal will be the date that the Office of the Registrar receives the completed Drop/Add form from the student or the date that the student drops the course(s) on BannerWeb.

Students who are unable to drop or withdraw from courses in person or with [my.ltu.edu](http://my.ltu.edu) BannerWeb may do so by mailing or faxing a written notice to the Office of the Registrar that includes their student ID number and signature. Students may also deposit forms in the Drop Box, located outside of the Student Service Center. To protect students' right to privacy, drops and withdrawals may not be conducted by telephone or e-mail.

Within certain time limits, full tuition adjustments may be made to the students' financial account. Be aware that there are times when students receive no tuition credit/refund for dropped courses. Official Drop/Add dates for each semester are available online on BannerWeb [my.ltu.edu](http://my.ltu.edu) and the Lawrence Tech website. It is the student's responsibility to know these dates and adhere to them.

It is important to note that exceptions to University policy are made only in rare circumstances, such as a debilitating illness. Requests made because of difficult work schedules or class schedules will not be considered.



## GRADES FOR COURSES DROPPED

Students who drop a course during the first two (2) weeks of classes during the fall or spring semester will receive a “Drop” on their Registration Form and no grade will appear on their transcript.

Students who withdraw from a course before the 13th week of the fall or spring semester but after the first two weeks of classes will receive the “W” grade.

The last day to withdraw from summer semesters and short courses within the regular fall and spring semester is adjusted for the shorter time period as follows:

Class Duration Period	Last Day for Withdraw
up to one week	3 days
up to two weeks	1 week
up to three weeks	2 weeks
up to four weeks	3 weeks
up to five weeks	4 weeks
up to six weeks	5 weeks
up to seven weeks	6 weeks
up to eight weeks	6 weeks
up to nine weeks	7 weeks
up to ten weeks	8 weeks
up to 11 weeks	9 weeks
up to 12 weeks	10 weeks
up to 13 weeks	11 weeks
up to 14 weeks	12 weeks
up to 15 weeks	13 weeks

After the last date to withdraw for any semester, students will not be permitted to withdraw from the course and will receive a grade as determined by the instructor (not a “W”).

All withdrawals or drops must be initiated by student action to assure that a “W” will appear on the master grade roster and subsequent transcripts. Faculty may not initiate withdrawal procedures nor may they submit a “W” on the electronic grade entry.

Drop and Withdrawal schedules for each semester may be obtained from the Office of the Registrar and are available on [www.ltu.edu](http://www.ltu.edu).

## SCHEDULE OF CLASSES

Programs for regular students are outlined in this *Undergraduate Catalog*. Class schedules giving the particular days and the hours of the various classes are made available during registration for each semester online at [www.ltu.edu](http://www.ltu.edu) and [my.ltu.edu](http://my.ltu.edu) BannerWeb.

## GRADE REPORTS

Grades are available at the end of each semester online through [my.ltu.edu](http://my.ltu.edu) BannerWeb. Report cards are mailed only upon student request to the Office of the Registrar. It is the student’s responsibility to seek their grades at the end of each semester.

## CHANGE OF CLASS SCHEDULE

Beginning the first day of classes, students may change their schedule by use of the Drop/Add form or online via [my.ltu.edu](http://my.ltu.edu), BannerWeb.

The student is responsible for submitting Drop/Add forms directly to the Office of the Registrar and retaining the validated student copy. Classes must be added during the first two weeks of classes.



All changes to the student’s schedule are effective on the date conducted via BannerWeb or the date the Office of the Registrar receives the form. Students are not permitted to attend courses without being officially registered.

## ATTENDANCE

Class attendance records of students are kept by all members of the faculty. The consequences of absenteeism will be determined by the instructor and will reflect his/her policy and judgment with respect to the effect of attendance on the student’s final grade.

## PREREQUISITES

Students are responsible for successfully completing prerequisite courses listed in this *Catalog* or in the [my.ltu.edu](http://my.ltu.edu) *Online Catalog* for all courses in which they are registered. In those exceptional circumstances where a prerequisite may be waived, the student must complete the Prerequisite Waiver Form and submit it to the department head or dean of the college offering the course. If a prerequisite is waived, it is

for one semester only and does not exempt the student from taking the waived prerequisite in the future.

Beginning the first day of classes, students may change their schedule using the Drop/Add form or online through [my.ltu.edu](http://my.ltu.edu) BannerWeb.

A student who is determined to have enrolled in a course without required prerequisites or an authorized waiver, may be required to withdraw at any time during the semester and will forfeit tuition and fees according to the normal University tuition credit policy.

## MID-TERM STATUS

The University pays close attention to the academic progress of students through their course work. An examination of a student’s record occurs during the midway point of the semester. Students having difficulty in courses are encouraged to seek assistance early from the faculty member teaching the course or to take advantage of the wide range of tutorial and other assistance available through the Dean of Students.

## STUDENT COMMUNICATIONS/ STUDENT EMAIL

Lawrence Tech's *official* method of communication with students is through the use of University email. Every student is issued a free email account. They are expected to check their Lawrence Tech email account frequently and regularly for notices related to enrollment and financial matters, including important deadline and date information.

All undergraduate students are issued laptop computers that enable them to check their email. Graduate students can check their mail through computer labs on campus. For assistance in accessing email off campus, contact the Edward Donley Computer Center, 248.204.3700.

The types of notices sent to students via Lawrence Tech email include:

- Academic policy changes
- Registration dates and deadlines
- Laptop pickup and return dates and deadlines
- Financial aid dates and deadlines
- Processes and dates for graduation
- Updates on student financial account

Notices regarding student and University activities (events, comedians, career fairs, speakers, etc.) are posted on Blackboard, *my.ltu.edu*.

All students are responsible for knowing about and complying with established policies and procedures. *By frequently checking their Lawrence Tech email, students can stay up to date and in the know!*



## ACADEMIC PROBATION

**Failure to Make Academic Progress** – Any student whose overall grade point average falls below 2.00 at the end of a semester will be placed on academic probation. Students on academic probation are required to have an advisor's signature to register or to add or drop any class.

**Academic Suspension and Dismissal** – Any student whose cumulative grade point average remains below 2.0 at the end of three consecutive semesters of their enrollment, or any student on academic probation who fails to meet the requirements of that probation, will be suspended from the University for a minimum of one calendar year. Veterans who do not meet the aforementioned requirements will lose their university certification for VA benefits. Engineering and architecture students are also subject to the continuation requirements as

described below.

At the end of the designated suspension period, undergraduate students who have been suspended from the University for academic reasons may submit a written petition for readmission to the chair of the Academic Standing Committee. This petition should be received six weeks before the first day of class for the semester in which the student wishes to return.

Students who have been suspended and subsequently readmitted who fail to meet the conditions of their readmission will be dismissed from the University. Students dismissed from the University under these circumstances may not be readmitted.

The University will not accept transfer credit for courses taken at another college or university during a period of one calendar year following suspension.

**Excessive Repeating and Withdrawal** – Students are expected to successfully complete all the courses in which they are registered and are encouraged to plan their schedules to avoid overloads and conflicts which would interfere with that objective. Any student who engages in excessive withdrawal from classes or who repeats a required course more than once is subject to academic review and may be placed on academic probation regardless of the overall grade point average. Subsequent continuation of this behavior may result in suspension or dismissal. Students may only register for the same course up to three times. After that point, the dean's signature is required to register. Circumstances demonstrably beyond a student's control will excuse him/her from this requirement, but poor scholarship will not.

**Failure to Complete Lower Division General Education Requirements** – Lower division (freshman and sophomore) General Education requirements are expected to be completed before entering the junior year (60 or more semester credits). Juniors who have not completed lower division General Education requirements must register for these courses each semester concurrently with upper division (junior/ senior) courses until the requirements are met.

Students who earn 90 semester credits without completion of lower division



General Education requirements will be placed on academic probation regardless of the grade point average, and they will not be permitted to register for courses in their major until these requirements are met.

## CONTINUATION REQUIREMENTS

**Architecture Upper Division Requirements** – Architecture students must have a minimum grade point average of 2.3 when they first reach 60 or more semester credits in order to enroll in junior level courses in the College of Architecture and Design. Should an architecture student not meet this requirement, the student must repeat courses in which a grade of “C-” or less was earned or otherwise improve the grade point average to meet the requirement.

No more than two “D” grades (D+, D, or D-) or one grade of D+, D, or D- in an architecture course may be counted toward an architecture degree.

The College of Architecture and Design requires that stu-

dents in the Bachelor of Fine Arts in imaging degree program earn a minimum grade of “B-” (2.7) in each architectural imaging studio course in the sophomore, junior, and senior year of the program. These courses may be repeated up to two times in order to improve performance. (Only grades of “C-” or lower may be recomputed.) Failure to satisfy this requirement will lead to suspension from the B.F.A. program. In addition to specific requirements for repeating courses, all courses in the College of Architecture and Design with earned grades of “C+” or lower may be repeated by a student in order to enhance learning and improve the cumulative GPA. Courses may be repeated up to two times to improve performance, with grades of “C-” or lower being eligible for recomputation.

**Engineering Upper Division Requirements** – Engineering students must have a minimum grade point average of 2.00 when they first reach 60 or more semester credits. Any engineering student with 60 or

more semester credits whose grade point average falls below 2.00 will be dismissed from the College of Engineering.

**Transfer Students in Architecture/Engineering** – Provided they meet other requirements and prerequisites, transfer students entering with 60 or more semester credits will be admitted to junior-level courses on the same basis as other Lawrence Tech students.

## PROBATION AND DISMISSAL POLICIES (GRADUATE/ PROFESSIONAL)

For information on policies pertaining to graduate students, see Lawrence Tech’s *Graduate Catalog*.

## ACADEMIC STANDING COMMITTEE/READMISSION

Undergraduate students who have been suspended from the University because of poor scholarship may, after one calendar year, submit a written petition for readmission to the chairperson of the Academic Standing Committee. This petition should be received six weeks before the first day of class of the semester in which the student wishes to return.

Evidence of planning, curriculum load, and work activities are taken into consideration when reviewing petitions for readmission. Petitions should be well organized, typed, and should include the student’s current address, phone number, student number, curriculum, and reasons

why the student had previous academic difficulty and why the student now feels he or she can be successful if readmitted.

The petition may include a letter from an employer attesting to competent work and maturity. An official transcript of courses taken at another institution must be submitted at the time the student applies for readmission. However, credit is not allowed for any work taken at another institution for the period of one calendar year following suspension. Once admitted, a student is required to abide by the graduation requirements outlined in the Catalog at the time of readmission. A student’s requirement for graduation may be subject to reevaluation.

Students wishing to re-apply to a graduate or professional degree program after having been suspended must make a regular application for admission.

## ENROLLMENT AT OTHER INSTITUTIONS

Students enrolled at Lawrence Tech may not take courses at other institutions after admission to Lawrence Tech and expect those credits to transfer without the prior written permission of the Credit Review Committee. Any courses taken in violation of this policy will be denied transfer or additional credit.

To be eligible for guest credit, students must: 1) have achieved a 2.0 GPA at Lawrence Tech; b) completed 24 credit hours or two (2) semesters at Lawrence Tech; c) satisfied the prerequisites



for the course(s) that they wish to take at another institution. If prerequisites are in progress for the requested course(s) at the time of submission of the Guest Credit form, a letter from the instructor(s) is required stating the student's grade in the course(s) as of that date and the instructor's opinion (at that point in time) of the student's capability to continue successfully in the requested course; d) completed the Guest Credit Approval form (available in the Office of the Registrar as well as on the website).

Students should complete the Guest Credit Approval Form and submit it to the Office of the Registrar at least one month in advance. The Credit Review Committee meets every two (2) weeks and reviews each request individually. The Registrar will then send a letter to the student informing him or her of the Committee's decision.

For those courses approved, the student must receive at least a 2.0 in the course to have it transfer back to Lawrence Tech. It is the student's responsibility to have the official transcript sent to the Registrar's Office at Lawrence Tech. Until the official transcript arrives, the credit will not be placed on the student's transcript. In addition, only the course will transfer to Lawrence Tech, not the grade. Lastly, approved guest credit courses may not be transferred back to Lawrence Tech to be used in grade point average recomputation.



Students are expected to complete all courses for a Lawrence Tech degree at the University once they have been admitted. Transfer credit is generally not given for courses taken at other institutions after enrollment at Lawrence Tech, unless those courses cannot be completed at the University.

## HONOR ROLL (DEAN'S LIST)

In recognition of students who achieve superior scholastic records, a Dean's List is published at the close of each semester, and an appropriate notation is made on students' academic records. This includes all students who have carried a minimum of 12 credit hours and have earned a GPA of 3.50 or higher. Part-time students must complete two semesters with at least six credit hours each semester, with a minimum GPA of 3.50 to be included on the honor

roll. If a student has selected confidentiality status, their name will not appear on published lists.

## RECORDS (Transcripts)

A permanent record of all credits earned at or transferred to the University is maintained for each student in the Office of the Registrar. These records are preserved indefinitely. All graduates are mailed a copy of their academic record at Lawrence Tech as soon as possible after their degree is reflected on the record.

At all other times, a nominal charge is made for all official copies of a student's record at Lawrence Tech. Copies of records (transcripts) will not be released without the student's authorization in writing. Transcripts will not be issued unless all financial obligations from prior semesters have been settled.

## ARCHITECTURAL DRAWINGS AND REPORTS

Architectural students are advised that all two- and three-dimensional drawings and models, as well as reports and other written studies submitted in satisfaction of any required or elective architectural courses become the property of the University, and may be kept or returned at the sole discretion of the dean of the College of Architecture and Design. When such work is kept, arrangements will be made for the student to receive suitable photographic copies as a record of his or her design work. Whenever any student work is exhibited or published, the student will receive proper acknowledgment of his or her efforts.

**INSPECTION OF RECORDS  
FAMILY EDUCATIONAL RIGHTS  
AND PRIVACY ACT OF 1974**

At Lawrence Technological University the following information is considered Directory Information about a student: dates of attendance, major field of study, class level, degrees and awards received, anticipated degree date and confirmation that the student is enrolled here (enrollment status).

In accordance with the provisions of the Family Educational Rights and Privacy Act (FERPA), this Directory Information can be released to the general public and may be listed in the campus directory, if one is published. Students may withhold this information from being released by completing the Student Request For Non-Disclosure Form. By completing this form, students are requesting that information not be released to non-university personnel nor listed in the campus directory, if one is published, for one year. Students must renew this form each year. Please note that in compliance with federal regulations there are situations in which particular information may be released, upon presentation of official documents, to designated state, local, or government agencies.

Students should consider carefully the impact of their decision to request confidential status. This means that after submission of the form, requests for this information from non-university persons or organizations will be refused.

Friends or relatives trying to reach a student will not be able to do so through the University; the student's name will not appear in the printed Commencement program; information that the student is enrolled at Lawrence Tech will be suppressed, so if a loan company, prospective employer, family member, etc., inquires about the student, they will be informed that there is no record of the student's attendance here.

Lawrence Tech will honor the student's request to withhold this information but cannot assume responsibility for contacting the student for subsequent permission to release the Directory Information. Regardless of the effect upon the student, Lawrence Technological University assumes no liability as a result of honoring the student's instructions that this information be withheld.

Once a student has designated a confidential classification, it will be removed after one year. If a student wishes the classification removed prior to then, the student should submit a signed authorization requesting that it be removed. This authorization form is available in the Office of the Registrar.

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. These rights are:

1. The right to inspect and review the student's education records within 45 days of the day the University receives a request for access. Students should sub-

mit to the Office of the Registrar written requests that identify the record(s) they wish to inspect. The University Registrar will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the Office of the Registrar, where the request was submitted, the University Registrar shall advise the student of the correct official to whom the request should be addressed.

2. The right to request the amendment of any of the student's education records that the student believes are inaccurate or misleading. Students may ask the University to amend a record that they believe is inaccurate or misleading. They should write the University official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate or misleading. If the University decides not to amend the record as requested by the student, the University will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

3. The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent, is disclosure to school officials with legitimate educational interests. A school official is defined as a person employed by the University in an administrative, supervisory, academic or support staff position (including the law enforcement unit and health staff); a person or company with whom the University has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Trustees; or a person assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.
4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA. The name and address of the office that administers FERPA is:

Family Policy Compliance Office  
U.S. Department of Education  
400 Maryland Avenue, SW  
Washington, DC 20202-4605





## ACADEMIC HONOR CODE

**A**cademic integrity and honesty are basic core values of Lawrence Technological University. In carrying out its academic mission, Lawrence Tech, like all universities, depends on the honesty and integrity of its faculty, staff, and students, and for this reason every member of the University community is charged with upholding the Academic Honor Code.

Actions that breach the Code erode the trust of those who look to universities for honest evaluations of academic work arrived at through honest processes. Violations may also cause individual harm in that reports of performance made to post-graduate schools, professional societies, and employers would inaccurately represent a student's progress.

Lawrence Technological University is committed to creating an academic community that values both individual and collaborative efforts that promote learning and discovery.

Such a community expects honesty and integrity in the work of all its members.

The Academic Honor Code speaks to the work of individual students within the community. It should not be construed as arguing against the important collaborations that also occur among students on campus. This document is intended to clarify the adjudication of issues regarding academic honesty and fair play for students. Portions of this document have been adapted from the 2002-03 University of North Carolina at Wilmington Academic Honor Code and the 2002-03 Binghamton University Academic Honesty Code.

### A. Academic Integrity

Students, faculty, and staff are expected to follow established standards of academic integrity and honesty. Academic misconduct entails dishonesty or

deception in fulfilling academic requirements and includes but is not limited to cheating, plagiarism, or the furnishing of false information to the University or a University affiliate in matters related to academics. An affiliate of the University is any person, organization, or company who works in conjunction with Lawrence Technological University for the purposes of assisting students in fulfilling their academic requirements. It is therefore this institution's stated policy that no form of dishonesty among its faculty or students will be tolerated. Although all members of the University community have an obligation to report occurrences of dishonesty, each individual is principally responsible for his or her own conduct.

### B. Academic Dishonesty Offenses

Violation of any of the following standards subject any student to disciplinary action:

1. **Plagiarism** – The term "plagiarism" includes but is not limited to (a) the use, by paraphrase or direct quotation, of the published or unpublished work or creative and/or intellectual property in print, product, or digital media of another person without full and clear acknowledgment; (b) the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers, reports, or other academic materials; or (c) the appropriating, buying, receiving as a gift, or obtaining by any other means another person's work and the unacknowledged submission or incorporation of it in one's own work. Plagiarism is unethical, since it deprives the true author of his/her rightful credit and then gives that credit to someone to whom it is not due. Examples include:
  - Quoting, paraphrasing, or summarizing written material, even a few phrases, without acknowledgment.
  - Failing to acknowledge the source of either a major idea or an ordering principle central to one's own paper.
  - Relying on another person's data, evidence, or critical method without credit or permission.
  - Submitting another person's work as one's own.
  - Using unacknowledged research sources gathered by someone else.
  - Copying portions or outcomes of two- or three-dimensional creative property of previously published work.
  - Copying items from Internet websites without acknowledgment of the source.

**2. Bribery** – The term “*bribery*” includes the offering, giving, receiving, or soliciting of any consideration in order to obtain a grade or other treatment not otherwise earned by the student through his/her own academic performance.

**3. Cheating** – The term “*cheating*” includes but is not limited to (a) use of or giving to others any unauthorized assistance in taking quizzes or examinations; (b) dependence upon aids beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; (c) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff; or (d) the unauthorized use of any electronic or mechanical device during any program, course, quiz, or examination or in connection with laboratory reports or other materials related to academic performance.

**4. Misrepresentation** – The term “*misrepresentation*” includes any act or omission undertaken with intent to deceive an instructor for academic advantage. Examples include:

- Using a computer program generated by another and handing it in as one’s own work unless expressly allowed by the instructor.
- Lying to an instructor to increase one’s grade.
- Lying or misrepresenting facts when confronted with an allegation of academic dishonesty.

**5. Conspiracy** – The term “*conspiracy*” means planning or acting with one or more persons to commit any form of academic dishonesty in order to gain academic advantage for oneself or another.

**6. Fabrication** – The term “*fabrication*” means the use of invented information or the falsification of research or other findings with the intent to deceive and thereby gain academic or professional advantage.

**7. Multiple Submissions** – The term “*multiple submissions*” means submitting substantial portions of the same work for credit more than once, unless there is prior explicit consent by the instructor(s) to whom the material is being or has been submitted.

**8. Unauthorized Collaboration** – The term “*unauthorized collaboration*” means collaborating on projects, papers, computer programs, lab reports, or other academic assignments where such collaboration has been

prohibited by the instructor.

**9. Sabotage** – The term “*sabotage*” means deliberately impairing, destroying, damaging, or stealing another’s work or working material. Examples include:

- Destroying, stealing, or damaging another’s lab experiment, computer program, term paper, exam, or project.
- Removing uncharged library materials with the effect that others cannot use them.
- Defacing or damaging library materials with the effect that others cannot use them.
- Hoarding or displacing materials within the library with the effect that others have undue difficulty using them.
- Interfering with the operation of a computer system so as to have an adverse effect on the academic performance of others.

**C. Jurisdiction**

All students enrolled at Lawrence Technological University are subject to the Academic Honor Code.

**D. Responsibility of the University Community**

**1. General Responsibility** – It shall be the responsibility of every faculty member, student, administrator, and staff member of the University community to uphold and maintain the academic standards and integrity of Lawrence Technological University. Any member of the University community who has reasonable grounds to believe that an infraction of the Academic Honor Code has occurred has an obligation to report the alleged violation.

**2. Student Responsibility** – Each student shall abide by the Academic Honor Code at all times.

**3. The Responsibility of Individual Instructors** – Instructors are encouraged to make their classes aware of the Academic Honor Code during the first week of each term.

**4. Responsibility of the University Administration** – The Office of the Dean of Students is responsible for the publication and dissemination of the Academic Honor Code and any amendments or changes approved by the Deans Council with the recommendation of the Faculty Senate and the Faculty Councils of the colleges. All new University faculty, administrative staff, personnel, and students should be advised of the Academic Honor Code upon becoming a member of the University community.



**5. Responsibility of the Office of the Registrar and the Office of the Dean of Students** – The Office of the Registrar and the Office of the Dean of Students shall receive and maintain comprehensive records of all matters relating to violations of the Academic Honor Code. The Office of the Registrar will receive a copy of the decision letter completed by the dean of the college, to be included in the student's academic record.

**E. Reporting and Adjudication Procedures**

**1.** An infraction of the Academic Honor Code may be reported by any member of the University community who has knowledge of such infraction. The infraction should be reported to the instructor of the course in which it occurred, where applicable. Such a report should be made within five (5) class days from the time of discovery unless extenuating circumstances prevent reporting.

**2.** Upon receiving a report of a violation or having reasonable evidence of a violation, the instructor in charge of the course or materials in question will inform the department chair or dean of the college in writing. The department chair or dean of the college will investigate the reported violation. The department chair or dean of the college will inform the student in writing of the reported violation and will request a written response from the student. If necessary, the department chair or dean of the college will conduct an interview with the student. The department chair or dean of the college will determine whether the student violated the Academic Honor Code.

**a.** If the student is found in violation, the student will receive an F grade in the course. This grade will not be recomputed for GPA purposes. The department chair or dean of the college will notify the student in writing of the decision. A copy of the letter will be put in the student's academic record and disciplinary file.

**b.** A student found in second violation of the Academic Honor Code will be expelled from the University.

**3.** If no action is taken by the instructor, the reporting party may file a written report of the allegation of academic dishonesty with the department chair or dean of the college. The department chair or dean of the college will investigate the reported violation. The investigative process will be conducted according to the provisions in Section E-2 above.

**F. Appeal Process**

**1.** Where appropriate, a student may appeal a finding of academic dishonesty to the dean of the College where the course is offered within seven (7) class days. The appeal shall be in writing.

**2.** An appeal shall be limited to review of the following:

**a.** To determine whether the student received fundamental fairness in the investigative and decision-making process.

**b.** To determine whether the facts in the case were sufficient to establish that a violation of the Academic Honor Code occurred.

**c.** To consider relevant and material new evidence.

**STUDENT PLEDGES**

In adopting this Honor Code, students of Lawrence Technological University recognize that academic honesty and integrity are fundamental values of the University community. The quality of a Lawrence Tech education is dependent upon the community acceptance and enforcement of the Honor Code. Students who enroll at Lawrence Tech commit to holding themselves and their peers to the highest standard of academic integrity. An individual who becomes aware of a violation of the Honor Code has an obligation to report this violation.

*Members of the Lawrence Technological University community pledge to hold themselves and their peers to the highest standards of academic honesty and integrity.*

**Undergraduate Students** – On all academic work submitted by undergraduate students at Lawrence Technological University, the following pledge is required:  
*“I have neither given nor received unauthorized aid in completing this work, nor have I presented someone else's work as my own.”*





**Graduate Students** – All graduate students at Lawrence Technological University are required to sign the student pledge when they start graduate studies:

*“I pledge that on all academic work that I submit, I will neither give nor receive unauthorized aid, nor will I present another person’s work as my own.”*

## STUDENT CODE OF CONDUCT

Lawrence Technological University is an institution that encourages the intellectual and personal growth of its students as scholars and citizens.

Lawrence Tech’s mission is to develop leaders through innovative and agile programs embracing theory and practice. In this pursuit, the University recognizes that the transmission of knowledge, the pursuit of truth, and the development of individuals require the free exchange of ideas, self-expression, and the challenging of beliefs and customs. Academic freedom is essential to the achievement of these purposes.

Honesty, integrity, and caring are essential qualities of an educational institution, and the concern for values and ethics is important to the whole educational experience. The Student Code of Conduct outlines the rights and responsibilities and expected levels of conduct of students in the University community. Fundamental to the achievement of community among the members of the University is the recognition by all such members that each shares a

responsibility to observe University regulations. This obligation, which is an extension of the citizen’s responsibility to observe the law of the land, is an essential corollary to participation in the academic rights afforded to members of the University.

A student voluntarily joins the Lawrence Tech community and thereby assumes the obligation of abiding by the standards prescribed in the Student Code of Conduct. The University, through the Office of the Dean of Students, maintains the exclusive authority to impose sanctions for behaviors that violate the Student Code of Conduct.

All students enrolled at Lawrence Tech have access to the Student Code of Conduct. Printed copies are available through the Office of the Dean of Students and the University Housing Office. The Student Code of Conduct, along with other helpful information, also may be accessed online at [www.ltu.edu](http://www.ltu.edu).

### **A. Definitions**

**1.** The term “*University*” means Lawrence Technological University.  
**2.** The term “*student*” includes all persons taking courses at the University both full-time and part-time, pursuing undergraduate, graduate, or professional studies, and those who attend post-secondary educational institutions other than Lawrence Technological University. Persons who are not officially enrolled for a particular term but who have a continuing relationship with the University are considered “students.”

**3.** The term “*faculty member*” means any person hired by the University to conduct classroom activities.

**4.** The term “*University official*” includes any person employed by the University to perform assigned administrative or professional responsibilities.

**5.** The term “*member of the University community*” includes any person who is a student, faculty member, University official, or any other person employed by the University. For the purposes of administering this Code, a person’s status in a particular situation will be determined by the Dean of Students.

**6.** The term “*University premises*” includes all land, buildings, facilities, and other property in the possession of or owned, used, or controlled by the University, including adjacent streets and sidewalks.

**7.** The term “*student organization*” means any number of persons who have complied with the formal requirements for University recognition.

**8.** The term “*judicial body*” means any person or persons authorized by the dean of students to determine whether a student has violated the Student Code and to recommend imposition of sanctions.

**9.** The term “*judicial officer*” means the dean of students. Other judicial officers may be authorized by the dean of students to assist in determining whether a student has violated the Student Code of Conduct and to impose sanctions.

**10.** The term “*shall*” is used in the imperative sense.

**11.** The term “*may*” is used in the permissive sense.

**12.** The term “*policy*” is defined as the written regulations of the University as found in, but not limited to, the *Student Handbook*, *Guidelines for University Living*, or *Undergraduate or Graduate Catalogs*.

**13.** “*Level I*” violations of the Code are those for which the sanctions may be a warning, disciplinary probation, special restrictions or loss of privileges, fines, restitution, imposed reassignment of course section or housing assignment, or assignments of discretionary sanctions. Level I violations will generally be heard by a University official.

**14.** “*Level II*” violations of the Code are those for which the sanctions may be, in addition to those listed in Level I, suspension from University Housing and/or from the University, or expulsion from University Housing and/or from the University. Level II violations will generally be heard by the Student Discipline Committee, which is composed of students.

### **B. Judicial Authority**

**1.** The dean of students shall determine the composition of judicial bodies and appellate procedures and determine which judicial body, judicial officer, and/or judicial board shall be authorized to hear each case.

**2.** The dean of students is that person designated by the University president to be responsible for the administra-

tion of the Student Code. The dean of students shall develop policies for the administration of the judicial program and procedural rules for the conduct of hearings that are not inconsistent with provisions of the Student Code.

**3.** Decisions made by the Student Discipline Committee and/or a University official designated by the dean of students shall be final, pending the normal appeal process.

**4.** The Student Discipline Committee may be designated as arbiter of disputes within the student community in cases that do not involve a violation of the Student Code. All parties must agree to arbitration and to be bound by the decision with no right of appeal.

### C. Regulations for Student Conduct

Acts of academic dishonesty are regulated by procedures outlined in the Academic Honor Code. Any student found to have committed the following misconduct is subject to the disciplinary sanctions outlined in Section G:

**1.** Acts of dishonesty, including but not limited to the following: furnishing false information to any University official, faculty member or office; forgery; alteration or misuse of any University document, record, or instrument of identification; helping or attempting to help another student commit an act of dishonesty; tampering with the election of any University-recognized student organization.

**2.** Disruption or obstruction of teaching, research, administration, disciplinary proceedings, other University activities,

including its public-service functions on or off campus or other authorized non-University activities, when the act occurs on University premises.

**3.** Physical abuse, verbal abuse, threats, intimidation, harassment, coercion, stalking, and hate crimes or acts that are racially motivated or due to one's sexual orientation, gender expression, and/or other conduct, that threatens or endangers the health or safety of any person.

**4.** Attempted or actual theft of and/or damage to property of the University or property of a member of the University community or other personal or public property.

**5.** Hazing, defined as an act that endangers the mental or physical health or safety of a student, for the purpose of initiation, admission into, affiliation with, or as a condition for continued membership in a group or organization.

**6.** Failure to comply with directions of University officials or law enforcement officers acting in performance of their duties and/or failure to identify oneself to these persons when requested to do so.

**7.** Unauthorized possession, duplication, or use of keys to any University premises or unauthorized entry to or use of University premises.

**8.** Violation of published University policies, rules, or regulations.

**9.** Violation of federal, state, or local law on University premises or at University-sponsored or supervised activities.

**10.** Use, possession, or distribution of narcotics or other controlled substances, except as expressly permitted by law; use or possession of drug paraphernalia.



**11.** Use, possession, or distribution of alcoholic beverages, except as expressly permitted by the law and University regulations, or public intoxication.

**12.** Possession of firearms, explosives, any object that by its intended or actual use may be used to threaten or harm people or damage or destroy property, or other weapons or dangerous chemicals on University premises.

**13.** Participation in a campus demonstration that disrupts the normal operations of the University and infringes on the rights of other members of the University community; leading or inciting others to disrupt scheduled and/or normal activities within any campus building or area; intentional obstruction that unreasonably interferes with freedom of movement, either pedestrian or vehicular, on campus.

**14.** Obstruction of the free flow of pedestrian or vehicular traffic on University premises or at University-sponsored

or supervised functions, or violation of any regulations outlined in the Lawrence Tech Parking and Traffic Regulations booklet.

**15.** Conduct which is disorderly, lewd, or indecent, breach of the peace; or aiding, abetting, or procuring another person to breach the peace on University premises or at functions sponsored, or participated in, by the University.

**16.** Theft or other abuse of computer time, including but not limited to: unauthorized entry into a file to use, read, change, or delete the contents or for any other purpose; unauthorized transfer of a file; unauthorized use of another individual's identification and password; use of computing facilities to interfere with the work of another student, faculty member, or University official; use of computing facilities to send intentionally obscene or abusive messages; use of computing facilities to interfere with normal operation of the University computing

system; use of computing facilities to invade the privacy or accounts of other users.

**17.** Tampering with any telecommunications services, including but not limited to: telephone, cable television, and/or voice mail; providing unauthorized service to another room, suite, or apartment by any means through unauthorized installation of wiring jacks or extensions.

**18.** Abuse of the judicial system, including but not limited to: failure to obey the summons of a judicial body or University official; falsification, distortion, or misrepresentation of information before a judicial body; disruption or interference with the orderly conduct of a judicial proceeding; institution of a judicial proceeding knowingly without cause; attempting to discourage an individual's proper participation in, or use of, the judicial system; attempting to influence the impartiality of a member of a judicial body prior to, and/or during, and/or after a judicial proceeding; harassment (verbal or physical) and/or intimidation of a

member of a judicial body prior to, during, and/or after a judicial proceeding; failure to comply with the sanction(s) imposed under the Student Code; influencing or attempting to influence another person to commit an abuse of the judicial system.

**19.** Actions that endanger the student, the University or local community, or the academic process, or cause harm to self or others.

**D. Jurisdiction, Violation of Law, and University Discipline**

**1.** Generally, University jurisdiction and discipline shall be limited to conduct which occurs on University premises or which adversely affects the University community and/or the pursuit of its objectives.

**2.** If a student is charged with an off-campus violation of federal, state, or local laws, but not with any other violation of this Code, disciplinary action may be taken by the University and sanctions imposed for grave misconduct which demonstrates flagrant disregard for the University

community. In such cases, no sanction may be imposed unless the student has been found guilty in a court of law or has declined to contest such charges, although not actually admitting guilt (e.g., "no contest" or "nolo contendere").

**3.** Lawrence Technological University disciplinary proceedings may be instituted against a student charged with violation of a law which is also a violation of this Student Code; for example, if both violations result from the same factual situation, without regard to the pending civil litigation in court or criminal arrest and prosecution. Proceedings under this Student Code may be carried out prior to, simultaneously with, or following civil or criminal proceedings off-campus.

**4.** When a student is charged by federal, state, or local authorities with a violation of law, the University will not request or agree to special consideration for that individual because of his or her status as a student. If the alleged offense is also the subject of a proceeding before a judicial

body under the Student Code, however, the University may advise off-campus authorities of the existence of the Student Code and of how such matters will be handled internally within the University community. The University will cooperate fully with law enforcement and other agencies in the enforcement of criminal law on campus and in the conditions imposed by criminal courts for the rehabilitation of student violators. Individual students and faculty members, acting in personal capacities, remain free to interact with government representatives as they deem appropriate.

**E. Initiation of Disciplinary Proceedings and Administrative Disposition**

All suspected violations of the Code will be reviewed in accordance with the procedures outlined below.

**1. Disciplinary Correspondence**

All disciplinary correspondence will be sent to the student's official mailing address as listed with the Office of the Registrar. The University reserves the right to use other reasonable means to notify students.

**2. Filing Complaints**

a. Any member of the University community may make a complaint and/or referral or offer information concerning such complaint and/or referral to the Office of the Dean of Students. A complaint or referral made against a student or students, alleging violation(s)





of the Student Code of Conduct shall be directed to the dean of students for review. Any complaint should be prepared in writing on a University incident report form and should be submitted as soon as possible after the event takes place, preferably within 48 hours.

- b. While action on a complaint of violating a University regulation is pending, the status of the student shall not be altered except for reasons outlined in Section I.

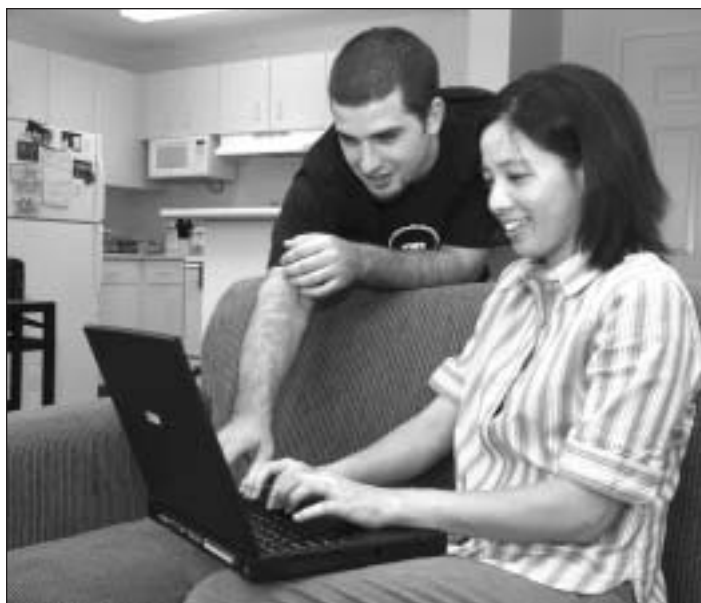
### 3. Presumption of Innocence

Any student charged with an infraction under this Code shall be presumed not responsible until proven responsible by a preponderance of evidence.

### 4. Preliminary Investigation

When the dean of students or designee receives information that a student has allegedly violated University regulations or local, state, or federal law, the dean or designee shall investigate the alleged violation and determine whether further action is necessary. After completing a preliminary investigation, the dean or designee may:

- a. Find no basis for the complaint and dismiss the allegation as unfounded, or
- b. Contact the student for a discussion and either:
  - (1) Dismiss the allegation.
  - (2) Identify that the alleged violation(s) equate to a Level I infraction and assign the case to a University official to conduct a judicial conference with the student(s).



- (3) Identify that the alleged violation(s) equate to a Level II infraction and schedule a hearing with the Student Discipline Committee.

### 5. Summoning a Student for a Judicial Conference

A judicial conference is a meeting between a student(s) involved in an alleged violation of the Code and a University official and may include sanctions. In some cases, the meeting may resolve the matter.

- a. The University official shall provide the student with:
  - (1) Written notice of the charge(s) and an outline of rights.
  - (2) Review of all available information, documents, exhibits, and a list of witnesses that may testify against the student.

- b. Following receipt of the notice of charges, a student:
  - (1) May elect not to contest the charges and to accept responsibility for them. If this election is made, the student must sign a waiver of the right to a hearing, and must accept the sanction imposed by the University official. The decision to waive a hearing and accept the sanction is final and not appealable.
  - (2) May contest the charges and elect to proceed to a hearing. The hearing shall be scheduled not less than five nor more than 15 calendar days from the judicial conference meeting.

### F. Hearing Process

Hearings provide the forum where parties to an allegation are afforded the opportunity to present information for review by a hearing board presided over by the chair of the Student Discipline Committee. The dean of students is an ex-officio member of the committee. A time shall be set for a

hearing, not less than five nor more than 15 calendar days after the student has been notified. The maximum time limit for scheduling of hearings may be extended at the discretion of the Dean of Students or designee.

Hearings shall be conducted by the Student Discipline Committee. Hearings shall be conducted according to the following guidelines:

- 1. In cases in which the Student Discipline Committee has been authorized by the dean of students to conduct a hearing, the recommendations of the members of the Student Discipline Committee shall be considered in an advisory capacity by the dean of students in determining and imposing sanctions.

**2. Composition:** The Student Discipline Committee is composed of 10 members: (a) two of three students recommended by the dean of each of the Colleges (Architecture and Design, Arts and Sciences, Engineering, and Management) and appointed by the provost; (b) two of three students recommended by the Student Government and appointed by the dean of students. The remaining students recommended by the deans of each of the Colleges and by Student Government will be appointed to an alternate candidate pool for the Student Discipline Committee in the event of a vacancy.

**3. Term of service:** Students shall serve for one academic year and may continue to serve at the discretion of the provost and the dean of students.

**4. Student eligibility:** All students, full- or part-time, shall be eligible for recommendation to the Student Discipline Committee provided they have maintained a 2.3 or better cumulative grade point average, are not currently on disciplinary probation, and have not been suspended from the residence halls or the University.

**5. Training:** All members of the Student Discipline Committee and students appointed to the alternate candidate pool, upon receiving notice of appointment, shall be given all necessary information about their responsibilities and the means for carrying them out.

**6.** Five students from the Student Discipline Committee will be chosen by the dean of students to hear a case.

**7.** Hearings normally shall be conducted in private. At the request of the accused student, and subject to the discretion of the dean of students, a representative of the University newspaper may be admitted, but shall not have the privilege of participating in the hearing.

**8.** Admission of any person to the hearing shall be at the discretion of the Student Discipline Committee and/or the dean of students or designee.

**9.** In hearings involving more than one accused student, the dean of students or designee, at his/her discretion, may permit the hearings concerning each student to be conducted separately.

**10.** The complainant and the accused have the right to be assisted by any advisor they choose, at their own expense. The advisor may be an attorney. The complainant and/or the accused are responsible for presenting his or her case and, therefore, advisors are not permitted to speak or to participate directly in any hearing before the Student Discipline Committee.

**11.** The complainant, the accused, and the judicial body shall have the privilege of presenting witnesses, subject to the right of cross-examination by the Student Discipline Committee and by each party.

**12.** Pertinent records, exhibits, and written statements may be accepted as evidence for consideration by the Student Discipline Committee, at the discretion of the dean of students.

**13.** All procedural questions are subject to the final decision of the dean of students.

**14.** After the hearing, the Student Discipline Committee shall determine by majority vote whether the student has violated each section of the Student Code that the student is charged with violating.

**15.** The Student Discipline Committee's determination shall be made on the basis of a preponderance of evidence, i.e., whether it is more likely than not that the accused student violated the Student Code.

**16.** There shall be a single verbatim record, such as a tape recording, of all hearings before a Student Discipline Committee. Tapes made during Student Discipline Committee hearings become part of the official record and shall be the

property of the University. These materials are confidential. They are made available in case of appeal and, upon request, to the Discipline Appeals Committee hearing the appeal and to the student(s) requesting the appeal.

**17.** If the charged student fails to respond to the required hearing in front of the Student Discipline Committee, a decision of responsible or not responsible will be made based on available information, with or without the charged student. If the charged student fails to attend the hearing, it shall be deemed that he or she denies all allegations. When appropriate, a sanction will be determined and the student will be notified in writing.

#### G. Sanctions

1. The following sanctions may be imposed upon any student found to have violated the Student Code:

- a. **WARNING** – A notice in writing to the student that the student is violating or has violated institutional regulations.
- b. **PROBATION** – A written reprimand for violation of specified regulations. Probation is for a designated period of time and includes the probability of more severe disciplinary sanctions if the student is found to be violating any institutional regulation(s) during the probationary period.
- c. **LOSS OF PRIVILEGES** – Denial of specified privileges for a designated period of time.

- d. **LOSS OF ACADEMIC CREDIT** – Failing grade assigned for the course due to academic dishonesty.
  - e. **FINES** – Previously established and published fines may be imposed.
  - f. **RESTITUTION** – Compensation for loss, damage, or injury. This may take the form of appropriate service and/or monetary or material replacement.
  - g. **DISCRETIONARY SANCTIONS** – Work assignments, service to the University, or other related discretionary assignments. (Such assignments must have the prior approval of the Dean of Students.)
  - h. **UNIVERSITY SUSPENSION** – Separation of the student from the University for a definite period of time, after which the student is eligible to return. Conditions for readmission may be specified.
  - i. **UNIVERSITY EXPULSION** – Permanent separation of the student from the University.
2. More than one of the sanctions listed above may be imposed for any single violation.
  3. Other than University expulsion, disciplinary sanctions shall not be made part of the student's permanent academic record, but shall become part of the student's confidential record. Upon graduation, the student's confidential record may be expunged of disciplinary actions other than University suspension or University

expulsion, upon application to the dean of students. Cases involving the imposition of sanctions other than University suspension or University expulsion shall be expunged from the student's confidential record three years after the student completes all requirements for graduation.

**4.** The following sanctions may be imposed upon groups or student organizations: those sanctions listed above, and/or deactivation/loss of all privileges, including University recognition, for a specified period of time.

**5.** In each case in which a University official determines that a student has violated the Student Code, the sanction(s) shall be determined and imposed by the dean of students. In cases in which the Student Discipline Committee has been authorized to determine that a student has violated the Student Code, the recommendation of all members of the judicial body shall be considered by the dean of students in determining and imposing sanctions. The dean of students is not limited to sanctions recommended by members of the Student Discipline Committee.

**6.** Following the hearing, the dean of students shall advise the accused student(s) in writing of its determination and of the sanction(s) imposed, if any. A copy of the notification will be retained in the student's disciplinary record. Cases involving suspension or expulsion will be filed in the student's academic record.

## H. Appeals

**1.** A decision reached by the Student Discipline Committee or a sanction imposed may be appealed by the accused stu-

dent(s) or complainant(s) to the Discipline Appeals Committee within seven school days of the decision. Such appeals shall be in writing and shall be delivered to the dean of students or designee.

**2. Composition:** The Discipline Appeals Committee is composed of three members: (a) the chair of the Faculty Senate; (b) the assistant provost for enrollment management; (c) the president of Student Government.

**3.** Except as required to explain the basis of new evidence, an appeal shall be limited to review of the verbatim records of the initial hearing and supporting documents for one or more of the following purposes:

- a. To determine whether the original hearing was conducted fairly in light of the charges and evidence presented, and in conformity with prescribed procedures, giving the complaining party a reasonable opportunity to prepare and present evidence that the Student Code was violated, and giving the accused student a reasonable opportunity to prepare and to present a rebuttal of these allegations.
- b. To determine whether the decision reached regarding the accused student was based on substantial evidence; that is, whether the facts in the case were sufficient to establish that a violation of the Student Code occurred.
- c. To determine whether the sanction(s) imposed was appropriate for the violation

of the Student Code, which the student was found to have committed.

- d. To consider new evidence sufficient to alter a decision or other relevant facts not brought out in the original hearing, because the person appealing did not know of such evidence and/or facts at the time of the original hearing.

**4.** If the Discipline Appeals Committee upholds an appeal, the matter may be remanded to the Student Discipline Committee for reopening of the hearing to allow reconsideration of the original determination and/or sanction(s).

**5.** In cases involving appeals by students accused of violating the Student Code, review of the sanction by the Discipline Appeals Committee may not result in more severe sanction(s) for the accused student. Instead, following an appeal, the Discipline Appeals Committee may, upon review of the case, reduce but not increase the sanctions imposed by the Student Discipline Committee.

**6.** In cases involving appeals by persons other than the student(s) accused of violating the Student Code, the Discipline Appeals Committee may, upon review of the case, reduce or increase the sanctions imposed by the Student Discipline Committee or remand the case to the Student Discipline Committee.

**7.** Following the appeal, the dean of students shall advise the accused student(s) in writing of its determination and of the sanction(s) imposed, if any. A copy of the notification will be retained in the student's disciplinary record. Cases involving suspension or expulsion will be filed in the student's academic record.

## I. Exceptional Procedures

### 1. Interim Suspension

In certain circumstances, the dean of students or designee may impose a University suspension prior to the hearing before a judicial body. Interim suspension is an action requiring that a student immediately leave the campus and University property.







- a. Interim suspension may be imposed only: a) to ensure the safety and well-being of members of the University property; b) to ensure the student's own physical or emotional safety and well-being; or c) if the student poses a definite threat of disruption of or interference with the normal operations of the University. During the interim suspension, the student shall be denied access to housing facilities and/or the campus (including classes) and/or all other University activities or privileges for which the student might otherwise be eligible, as the dean of students or designee may determine to be appropriate.
- b. Any student who is suspended on an interim basis and returns to the campus and University property during the suspension shall be subject to further disciplinary action and may be treated as a trespasser.

Permission to be on campus for a specific purpose (e.g., to take an exam, to consult with the dean of students, or to participate in the disciplinary procedures) may be granted in writing by the dean of students or designee.

**2. Suspension from the Housing Facilities**

The director of residence life or the dean of students or designee may, when charges are served, suspend a student or students charged from the housing facilities pending the hearing and determination thereof, whenever the continued presence of such a student would constitute a danger to the student or to the safety of persons or property in the housing facilities, or would pose a threat of disruptive interference with the normal conduct of housing facility activities and functions, or the seriousness of the charges warrants such action. The dean of students or designee shall grant an immediate review (by the end of the next business

day after the suspension) on request of any student so suspended with respect to the basis for such a suspension, at which time the suspended student may have the right to present statements tending to show that the basis for the executive suspension from the housing facilities does not exist. Suspension may apply to all housing facilities, an individual residence hall/apartment, or any portion thereof.

**3. Residence Hall/Temporary Reassignment and Restriction from Facilities**

The director of residence life or the dean of students or designee may temporarily reassign a resident to another facility and/or restrict a resident from specific campus facilities pending an investigation and/or hearing whenever the continued presence of a resident in a particular campus facility would constitute a danger to the student or to the safety of persons or property in the housing facilities and campus facilities, or the seri-

ousness of the allegations warrants such action. The director of residence life shall grant an immediate review (by the end of the next business day after the temporary reassignment and/or restriction) on request of any resident so reassigned and/or restricted with respect to the basis for such a reassignment and/or restriction.

**4. Temporary Restriction from Personal Contact**

The director of residence life or the dean of students or designee may temporarily restrict a student from any personal, verbal, written, telephone, electronic, and third-party contact with another person pending an investigation and/or hearing whenever the contact could constitute a danger to the person or to the safety of the person or property, or the seriousness of the allegations warrants such action. Any student so restricted may obtain an explanation of the basis for such restriction upon request.

**5. Withdrawal Prior to Disposition of Disciplinary Proceedings**

The student who withdraws or fails to return to the University while disciplinary action is pending will be ineligible for readmission until the outstanding matter is resolved. The University reserves the right to formally restrict individual(s) from the campus grounds while such action is pending. Any further readmission would require an appeal in writing to the dean of students or designee and approval by the dean of students or designee.

**J. Interpretation and Review**

**1.** Any question of interpretation regarding the Student Code shall be referred to the dean of students for final determination.

**2.** The Student Code will be reviewed every three years under the responsibility of the dean of students with the input of an advisory team.

**NON-DISCRIMINATORY POLICY**

Lawrence Technological University adheres and conforms to all federal, state, and local civil rights regulations, statutes and ordinances. No person, student, faculty, or staff member will knowingly be discriminated against relative to the above statutes. Lawrence Technological University is an equal opportunity employer. Direct inquires regarding non-discriminatory policies to:  
Office of Student Affairs,  
21000 West Ten Mile Rd.,  
Southfield, MI 48075-1058,  
248.204.4100.

**SEXUAL HARASSMENT POLICY**

It is the policy of Lawrence Technological University to maintain an environment free of sexual harassment for students, faculty, staff, or any other constituency. Sexual harassment is contrary to the standards of the University community. It diminishes individual dignity and impedes equal employment, educational opportunities, and equal access to freedom of academic inquiry. It will not be tolerated at Lawrence Technological University.

**What is Sexual**

**Harassment?** – Harassment on the basis of sex is a violation of the Elliott-Larsen Civil Rights Act; Michigan Civil Service Commission Rules; the Office of Federal Contract Compliance regulations; and Title VII of the Civil Rights Act of 1964. According to guidelines issued by the Equal Employment Opportunity Commission in 1980, “Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature, even between people of the same sex constitutes sexual harassment when:

- 1.** Submission to such conduct or communication is made either explicitly or implicitly a term or condition of an individual’s employment, education, or participation in a University activity; or
- 2.** Submission to, or rejection of, such conduct or communication by an individual is used as the basis for decisions affecting an individual’s employment, education, or participation in a University activity; or
- 3.** Such conduct or communication has the purpose or effect of unreasonably interfering with an individual’s work or educational performance or of creating an intimidating, hostile, or offensive employment or education environment.
- 4.** Sexual harassment can also exist when there has been no tangible job detriment (i.e., a significant change in employment status, such as hiring, fir-

ing, etc.). Courteous, respectful, pleasant, non-coercive mutual interactions between employees are not considered sexual harassment.

**5.** Personal (i.e., intimate) relationships that occur between persons who are in a supervisory - subordinate work relationship must be reported to the next level of management. In such situations, the department will take appropriate action.”<sup>1</sup>

Although these guidelines, based on Title VII, apply specifically to sexual harassment in the workplace, they should be interpreted to apply to students as well under Title IX of the 1972 Education Amendments. As has been pointed out by the National Advisory Council on Women’s Educational Programs (NACWEP), there is a serious problem “... of harassment by gatekeepers — those who teach required courses or who have the authority to make critical decisions about a student’s advancement. The extraordinary importance of such positions lends an exceptional degree of significance to every interaction with students, and makes sexual harassment of all types particularly harmful.”

**Common Types of**

**Harassment** – The NACWEP describes five classifications of harassment commonly reported by students and working women.

**1.** Generalized sexist remarks or behavior (e.g., “This is a man’s job.” “That’s women’s work.” “Women/men are incompetent at/are better suit-

ed to...”). Leering or staring, crude sexual remarks, off-color jokes, suggestive stories, and other related behaviors are also grouped in this category.

“This type of behavior is close to racial harassment in appearance; the sentiments or actions involved are often fiercely anti-male or anti-female and are not intended to lead to sexual activity. They are directed to the (individual) because of gender and can often affect whole classrooms; the offense may be ‘generalized’ both by its nature and its audience. There can be an inherent sexual content in or underlying such remarks that establishes a tone which in its awkwardness is more damaging than many overt acts.”<sup>2</sup>

**2.** Inappropriate and offensive sexual advances (e.g., requests for social or sexual encounters, often accompanied by, touching).

This type of harassment, while not necessarily threatening, usually makes the recipient uncomfortable. This discomfort may cause the recipient to avoid the perpetrator in the future, thus limiting his or her ability to function properly in the academic environment. Discomfort caused by harassment behavior will almost certainly affect future professional and personal relationships.

**3.** Solicitation of sexual activity or other sex-related behavior by promise of rewards (e.g., grades, promotions, promises of greater opportunities, etc.).

“This category, in its extreme, literally amounts to an attempt to purchase sexual behavior. In its more blatant forms this type of behavior can

be prosecuted as a criminal act ... even ‘banter’ along this vein may cause harm. Students may be mystified and confused by the interaction due to the power of the initiator. This is especially the case where the student propositioned is young or naive, and may fail to fully grasp the significance of the request.”<sup>3</sup>

**4. Coercion of sexual activity by threat of punishment (e.g., refusal to comply with a sexual request or invitation results in a threat of failure, loss of job or promotion, or access to academic referrals).**

“What is at stake is often more than one grade or a single recommendation — too frequently it is access to a discipline and so a career is jeopardized.”<sup>4</sup>

**5. Sexual crimes and misdemeanors (e.g., criminal sexual assault [rape, indecent exposure, etc.] across authority lines (faculty/student or employer/employee) or among colleagues and peers.**

“This category refers to acts which, if reported to police authorities, would be considered crimes or misdemeanors.”<sup>5</sup>

### **Preventing Sexual Harassment**

Although the ultimate burden for prevention of harassment rests with those in supervisory positions, others should be aware that their actions may be construed as harassment. Following are some suggestions to supervisors, staff, faculty, and students for preventing sexual harassment, regardless of who is perpetrator and who is recipient.

- Avoid sexist remarks, off-color stories, or lewd jokes.

- Keep doors open when possible.
- Ask someone to accompany you if you suspect that you may be harassed.
- Make it plain that your intentions are not sexual in nature.
- Make clear, through your behavior, conversation, and actions, that you find sexual harassment offensive and inappropriate.

### **Combating Sexual Harassment**

– Employees, students, or faculty who feel they are experiencing this form of discrimination should:

- 1. Say “No” Clearly.** Inform harasser that his or her attentions are unwanted. If the behavior persists write a memo to the harasser asking him or her to stop; keep a copy.
- 2. Document the Harassment.** Record date, time, and place of each incident. Keep a copy at home.
- 3. Get Emotional Support** from family and friends.
- 4. Document Work Evaluations.** Keep copies of performance evaluations and memos that attest to the quality of your work.
- 5. Identify Witnesses/Other Victims.** You are probably not the first person who has been mistreated by this individual. Ask around; you may find others who will support your charge.<sup>6</sup>

The least effective way to deal with sexual harassment is to ignore it. Unless the recipient of unwanted sexual attention takes some kind of action (whether formal or informal), the harasser is very likely to continue or even escalate the harassing behavior.



The following suggestions for combating sexual harassment reflect a variety of options, ranging from informal methods to formal procedures.

### **Confidential Counseling**

– Students may obtain information about or assistance with sexual harassment issues from the Office of the Dean of Students. Staff, faculty, and administrators should seek help from Personnel Services. University representatives can advise and support complainants and witnesses in a confidential setting. The complainant, alleged harasser, and any witness shall be informed that all records of complaints, statements, interviews, contents of meetings, results of investigations, and any other relevant materials will be kept confidential by the employer, except where disclosure is required by a grievance process or pursuant to a legal action.

Unless otherwise authorized by law, disclosure, or publication, by any person, of the complaint, the facts or the identity of involved parties or witnesses is prohibited and subject to disciplinary action. Discussions with representatives of the above-mentioned offices will not be considered official reports to the University and will not, without additional action by the complainant, result in intervention or corrective action. When intervention and discipline result against the alleged harasser, appropriate reference will be made in his or her file to protect the privacy of the complainant and witnesses.

### **Informal Resolution**

– At the complainant’s option, a sexual harassment report or complaint will be taken from staff by Personnel Services and from students by the Office of the Dean of Students or any dean, director, department head, the director of residence life, and/or their designees. Each College or



other University organization will designate both men and women to receive complaints.

The person who receives a sexual harassment report of complaint will advise the person who makes the complaint about the informal and formal resolution alternatives available. At the complainant's option, the person receiving the complaint can:

- provide information about sexual harassment;
- help the complainant deal directly with the alleged offender;
- assist with or mediate a resolution of the problem within the complainant's unit; and/or;
- help the complainant prepare a written complaint and pursue formal action.

Informal resolution measures should address the particular circumstances. No action will be taken against the alleged offender if the resolution is kept informal. Any discussion with the accused individual should, unless the provost or manager of personnel services specifically decide otherwise, include the supervisor of accused staff, faculty, or administrators. Any discussion with an accused student will include a member of the Division of Student Affairs and the student's department chair.

**Formal Resolution Process** – Either subsequent to or instead of following the informal process, a complainant may elect to make a formal charge of sexual harassment. The University will investigate all formal charges of sexual

harassment and take appropriate actions pursuant to the results of the findings.

There are several mechanisms available to pursue a formal charge, and their availability depends on the status of the complainant:

1. A student should notify the Office of the Dean of Students. If this is not possible, then the student may contact the Offices of the President or Provost.
2. A member of the staff, faculty, or administration may notify his or her supervisor; a department head or dean, the Offices of the President or Provost, the Office of Personnel Services, or the Office of the Dean of Students. A student-employee may also notify any of these.
3. Contract employees should follow the same procedure followed by staff, faculty, and administrators.

**Take complaint directly to EEOC** – Call the Office of Civil Rights at 216.522.4970 to make a sexual harassment complaint. Report all incidents of criminal sexual assault to the Office of Campus Safety Services at 248.204.3945 or the Southfield Police Department at 248.354.4720.

**Counseling Can Help** – Sexual harassment undermines the confidence of a student or employee and adversely affects his/her attitude and job or academic performance. All students and employees may talk, confidentially, to trained counselors in the Division of

Student Affairs if they believe they have been sexually harassed.

Counselors can be an immediate source of help by:

- encouraging the victim to report the incident(s);
- acting as a liaison between the victim and management;
- helping the victim readjust to the work or school environment; and
- helping the victim regain confidence.<sup>7</sup>

Counselors can also help management develop a proactive approach to dealing with sexual harassment issues by incorporating discussions on the topic during workshops, seminars, and/or training sessions.

**References:**

1. According to the United States Supreme Court in *Oncale v. Sundowner Offshore Services, Inc.*, No. 96-569 (1998).
2. Till, Frank J. "Sexual Harassment: A Report on the Sexual Harassment of Students, the National Advisory Council on Women's Educational Programs, August 1980." Reprinted from *Sexual Harassment: Definition and Prevention* (State University of New York at Binghamton, 1988). Reprinted with permission.
3. *Ibid.*, 16.
4. *Ibid.*, 17.
5. *Ibid.*, 22.
6. *Sexual Harassment: What Every Working Woman Needs to Know* (<http://www.cs.utk.edu/~bartley/other/pto5.html/>).

7. Reprinted from *Where Do You Draw the Line? Sexual Harassment in the Workplace* (American Counseling Association), p. 4. Reprinted with permission. No further reproduction authorized without written permission of American Counseling Association.

**PARTICIPATION IN THE U.S. DRUG PREVENTION PROGRAM**

Lawrence Technological University is committed to promoting and maintaining a work and academic environment that is free from illegal use of alcohol and drug use/abuse, in accordance with all federal, state, and local laws as well as the Drug Free Schools and Campus Safety Act. Lawrence Technological University is in compliance with all provisions of the U.S. Department of Education Drug Prevention Program, which is a condition of the University's eligibility to receive federal funds or any other form of federal financial assistance.

Applicable policies are provided in sections 16.0 and 16.1 of the *Staff Handbook*, section 2.18 of the *Faculty Handbook* and in the Policies, Procedures and Regulations section of the *Student Handbook*. The University specifically prohibits the unlawful possession, use, or distribution of illicit drugs and alcohol by students and employees on its property



or as a part of its activities (except at University functions at which alcohol use is approved). Use of alcoholic beverages at any University function requires the approval of the executive vice president and provost or his or her designee.

Employees, students, and campus visitors age 21 years or older, who consume alcohol at University functions or while on University business where such use is approved, are expected to use alcohol responsibly and not engage in illegal, unprofessional, or disruptive behavior. Violators will be subject to penalties, which may include expulsion or separation from the University. Any employee or student found to be in violation of University policy regarding drugs or alcohol will be subject to disciplinary action up to

and including dismissal in accordance with applicable disciplinary procedures.

Possession, use, or distribution of illicit drugs, possession or consumption of alcoholic beverages by individuals under 21 years of age, and distribution of alcohol without a license or permit issued by a competent legal authority are violations of local, state, and federal laws. It is the policy of the University to cooperate fully in any prosecution based on violation of these laws and to report all known violations to the appropriate law enforcement agencies.

A variety of serious health risks are associated with the use of illicit drugs and the abuse of alcohol. These include permanent damage to the liver, brain, and other vital organs, heart damage or malfunction, including sudden death, and accidents caused by impaired judgment or abilities. Individuals who may have a

drug dependency or alcohol abuse problem are advised to contact the Oakland County Drug and Substance Abuse Center, 248.858.5200.

#### LIABILITY DISCLAIMER

Lawrence Technological University shall not be liable for any injuries to, or property damage or loss suffered by, any student regardless of cause. This disclaimer of liability shall apply to, but not by way of limitation, the following:

- Any injury or damage incurred on property owned by or under the control of the University, or its subsidiaries, such as classrooms, apartments or other housing, any other structures, all common areas and grounds, and vehicles;

- Any injury or damage incurred as a participant, spectator or otherwise in any intramural or intercollegiate or other event or contest, athletic or otherwise, or while in transit thereto or therefrom;
- Any injury or damage suffered while engaged in or attending a classroom or related activity, whether required or elective, and regardless of cause;
- Any injury or damage suffered by reason of theft, fire, damage by the elements, or other casualty;
- Any injury or damage suffered by reason of any act or omission of any University trustee, officer, member of the faculty or staff, employee, contractor or student.

By applying for admission or readmission to the University, or by continuing their enrollment with the University for a subsequent semester, students accept the foregoing disclaimer and agree to be bound thereby. Emergency referrals are made to community agencies. Any expenses incurred are the responsibility of the student.



**L**awrence Technological University offers curricula leading to the following degrees and certifications. (For information on graduate degrees, see the *Graduate Catalog* or [www.ltu.edu](http://www.ltu.edu)):

**Certificate, Undergraduate**  
 Computer Science  
 Cooperative Education – Engineering  
 Cooperative Education – Technology  
 Entrepreneurship  
 Global Engineering  
 Industrial/Organizational Psychology  
 Leadership and Change Management  
 Technical and Professional Communication  
 Web and Electronic Commerce

**Associate of Science**  
 Chemical Technology  
 Communications Engineering Technology (*new*)\*  
 Construction Engineering Technology  
 Electrical Contracting Technology  
 Manufacturing Engineering Technology

Mechanical Engineering  
 Technology  
 Radio and Television Broadcasting  
 University Studies

**Bachelor of Facility Management**

**Bachelor of Fine Arts**  
 Imaging

**Bachelor of Interior Architecture**

Bachelor of Science  
 Architecture  
 Biomedical Engineering (*new*)\*  
 Business Management  
 Chemical Biology (*new*)\*  
 Chemistry  
 Civil Engineering  
 Computer Engineering  
 Computer Science  
 Construction Management  
 Electrical Engineering  
 Engineering Technology  
 Environmental Chemistry  
 Humanities  
 Industrial Management  
 Information Technology

Interior Architecture/Design  
 Mathematics  
 Mathematics and Computer Science  
 Mechanical Engineering  
 Physics  
 Physics and Computer Science  
 Psychology  
 Technical and Professional Communication  
 Technology Management

**Pre-Professional Programs** (*non-degree*)  
 Pre-Biomedical Engineering  
 Pre-Dental  
 Pre-Law  
 Pre-Medical

**Master of Architecture**  
 Professional Degree  
 Post-Professional Degree

**Master of Business Administration**

**Master of Business Administration** (*weekend*)

**Master of Civil Engineering**

**Master of Construction Engineering Management**

**Master of Educational Technology** (*new*)\*

**Master of Engineering**  
 Manufacturing Systems

**Master of Engineering Management**

**Master of Interior Design**

**Master of Science Education**

**Master of Science**  
 Automotive Engineering  
 Civil Engineering  
 Computer Science  
 Electrical and Computer Engineering  
 Industrial Operations\*\*  
 Information Systems  
 Mechanical Engineering  
 Operations Management  
 Technical and Professional Communication

**Certificate, Graduate**  
 Energy and Environment Management  
 Manufacturing Systems  
 Non-Profit Management and Leadership  
 Project Management

**Doctor of Business Administration**

**Doctor of Management**  
 Information Technology

**Doctor of Engineering**  
 Manufacturing Systems

*\*designates new programs. Contact Admissions or College for supplemental curriculum information.  
 \*\* (currently enrolled students only)*



**HONORS PROGRAM**

High-achieving students are invited to participate in the University Honors Program. Individual departments at Lawrence Tech offer honors course work, either in stand-alone honors courses, regular courses with an “honors option,” or special sections of standard courses. The accumulation of sufficient honors credit through the completion of honors course work leads to the distinction of graduating “with honors.” This distinction is noted on the student’s transcript and diploma.

The Honors Program exists to:

- serve and challenge high-achieving students;
- enhance the intellectual and social climate for high-achieving students;
- encourage students to enhance and diversify their college experience by taking courses, including interdisciplinary projects, beyond the requirements of their majors;
- develop students’ leadership potential through academic achievement and service to the University and the community.

**DOUBLE MAJORS**

Students who want to broaden and enhance their educations have the opportunity to earn majors in two areas in a reasonable time frame. In order to earn a double major, students simply complete all of the course requirements for both majors. Because of overlapping core course requirements and open electives in both majors, a double major can be earned, for example, in mathematics and humanities, with as few as 135 credit hours. The number of credit hours required varies depending on the choice of majors.

Interested students are encouraged to consult the department chairs of the two majors being considered. Careful planning and course scheduling will facilitate the completion of both majors in the shortest time.

**UNDECLARED MAJORS**

The University welcomes students interested in exploring their educational options prior to declaring a major. While completing general education courses common to all degree

programs, undeclared students may also select introductory courses in various disciplines during their first year as a way to learn more about these areas of study. Academic advisors and career services professionals will be available to assist students in selecting the major best suited to their interests and abilities.

**SIMULTANEOUS ENROLLMENT**

Students may be simultaneously enrolled in appropriate associate’s and bachelor’s degree programs. Typical combinations are:

- A.S. in Engineering Technology/B.S. in Technology Management
- A.S. in Engineering Technology/B.S. in Engineering Technology
- A.S. in Chemical Technology/B.S. in Chemistry

**THE CORE CURRICULUM**

The distinctive Lawrence Tech Core Curriculum provides a comprehensive, interactive engagement with writing, speaking, literature, history, philosophy, mathematics, science, and the arts. The Core is structured to give students an intellectual experience in common with fellow students through shared reading, directed discussion, group presentations, and problem-solving teamwork.

The Core learning community, shared with students from all majors, is built on:

- **Four** courses in humanities, based on reading the great books and experiencing the great art of world civilization:

- Foundations of the American Experience
- Development of the American Experience
- World Masterpieces 1
- World Masterpieces 2
- **Two** courses in communication, written, oral, and visual:
  - English Composition
  - Technical and Professional Communication
- **Two** courses in mathematics, where what is studied depends on the major selected
- **Two** courses in the natural sciences, including laboratory experience
- **One** upper-division elective in the humanities or social sciences, to add depth to the educational experience.

Lawrence Tech’s Core Curriculum education for leadership offers:

- The ability to read and analyze challenging texts
- The poise to articulate ideas orally and in writing
- The capacity to evaluate conflicting ideas
- The savvy to seek alternative solutions to problems in many fields
- The stamina to succeed in difficult projects
- The experience of working in, and leading, teams
- An understanding of the past and role as a citizen in a free society
- The competency to simplify complex problems through manipulation of symbols
- The discipline to apply scientific principles to improve understanding
- The confidence to be creative.



Designed for excellence, the Core Curriculum seeks to prepare students to take a leadership role in the diverse world where they will learn, build their career, and contribute to their community. The Core's blend of deep knowledge, broad understanding, and analytical thinking seeks to provide the confidence to help students determine their life's course, make meaningful contributions to the lives of others, and achieve success in their professional field.

The development of the scientific method is one of the hallmarks of Western thought. The Natural Sciences Core exposes students to a full year of rigorous training in one or more of the natural sciences, including at least one laboratory course. The value of this exposure is not limited to the technical skills acquired. No matter what major is selected, the goal is to understand more fully scientific thinking, its limitations, and its implication for other disciplines.

In the Humanities Core, students are expected to read many of the best books written in science, literature, philosophy, and politics. They discuss those original texts, defend their interpretations of them, and analyze and evaluate the ideas under discussion. They will write clear, well-reasoned papers about what they've read and discussed. Students will learn the value of editing and perfecting what they write, of working in teams, and of presenting ideas orally.

In the Mathematics Core, students will develop both mastery of skills and an understanding of the impact of

mathematics on Western culture. Beyond being able to perform basic arithmetical operations, students will be expected to understand the use of symbols to represent numbers, manipulate those symbols, and use those skills to solve complex problems. The goal is to understand relationships within data through equations, inequalities and graphs. Students are exposed to higher-level abstraction through the concept of functions and their manipulation, and to the calculus, including its impact on the development of science and Western thought.

Computers are so much an integral part of modern life that the ability to use them is essential. Lawrence Tech has been at the forefront of computer use in academic programs since the inception of the Core Curriculum in 1994. When laptops were first provided to freshmen in 2000, satisfying the computer component of the Core simply became a requirement for success in Lawrence Tech courses. No matter what their major, students will find that the computer is an integral part of the Lawrence Tech academic experience.

**REQUIREMENTS FOR GRADUATION**

The University reserves the right to modify its graduation and other academic requirements as may seem necessary from time to time. It is obligated only during the academic year of the student's registra-

tion by requirements published in the *Catalog* for that year.

**Statement on General Education**

Lawrence Technological University is a focused, technologically oriented university which places emphasis on preparing students for careers in management, engineering, technology, architecture and design, computer science, science, the humanities, communication, and mathematics. Underlying specific program objectives is a principle that all graduates of the University, regardless of their major area, should receive a liberal education that prepares them to contribute as citizens and enlightened professionals.

The undergraduate General Education requirements insure that students interact with students and faculty in program categories other than their major and obtain both breadth and depth in the humanities, social sciences, mathematics and analysis, and the natural sciences, consistent with the basic educational philosophy of the University.

These requirements are summarized by six basic statements that apply to all baccalaureate curricula:

1. All graduates must be literate and skilled in communication including basic English composition and specialized communication appropriate to their individual major programs;
2. All graduates must be aware of the diverse basis of our culture and must demonstrate both breadth and depth in an area of the arts and humanities;

3. All graduates must be aware of the foundations of our society and the development of social issues;

4. All graduates must be aware of the scientific understanding of the natural world, including laboratory experience;

5. All graduates must have analytical skills consistent with the technological focus of the University, including mathematics through basic calculus and the use of computers in their major fields;

6. All graduates must have a cohesive major program that integrates their basic education with both theory and practical applications in an area of interest to the University faculty.

**Curriculum Requirements for All Four-Year Undergraduate Majors**

Students who enter the University as freshmen (less than 30 hours of transfer credit) seeking a baccalaureate degree, must satisfy the General Education requirements through completion of the following course sequences. (Students who transfer to Lawrence Tech with more than 30 semester hours should follow the General Education transfer procedures in the Admissions section of this Catalog.) The credits shown are the minimum required to satisfy requirements in a category.

**Communications**

English Composition	3 sem cr
Professional and Technical Communication	3 sem cr

## Humanities and Social Sciences

World Masterpieces 1 and 2	6 sem cr
Foundations and Development of the American Experience	6 sem cr
Additional Social Science Elective or course specified for a major	3 sem cr
Junior- or Senior-Level Elective	3 sem cr
	<i>Minimum</i>
Communications, Humanities, Social Sciences	24 sem cr

## Natural Science

Two semesters of Natural Science courses	6 sem cr
Science Laboratory	1 sem cr

## Mathematics and Analysis

Mathematics through Basic Calculus	7 sem cr
Demonstration of competency in use of the computer in the major field	
<i>Minimum</i> Science and Mathematics	14 sem cr
<i>Minimum</i> Total General Education	38 sem cr

Degrees are awarded to candidates who have fulfilled the following requirements:

- Satisfactory completion of all requirements in one of the degree programs as set forth in the Catalog. Any student required to take Basic Studies courses (course level zero) will receive credit hours and grade points for such courses, but the credit hours earned for these Basic Studies courses will not be included in the total hours required for graduation;

- Attainment of a minimum grade point average of 2.00 in all credit hours earned at Lawrence Tech;
- Completion of the last two semesters of work for a degree at Lawrence Tech:  
For Associate degrees this is a minimum of 24 credit hours, including 12 hours in the specialty courses of the chosen curriculum;  
For Bachelor of Science and Bachelor of Fine Arts degrees this is a minimum of 30 credit hours, including 14 hours in the student's major;
- Submission of a Petition for Graduation approximately one year preceding the date of expected graduation. Contact the Registrar's Office for specific graduation petition due dates. A new petition must be submitted in the event requirements for graduation are not completed before the end of the Summer semester;
- Full payment of all financial obligations to the University.
- Successful completion of the writing proficiency examination.

**Further requirements** – The minimum expectation for the successful completion of art, architecture, and interior design studio course work in the College of Architecture and Design necessitates that for every hour of in-class studio time per week, an equal amount of course hours of outside work be devoted to the accomplishment of studio and studio related course projects and assignments.

Technical and non-technical electives appropriate for each curriculum will be defined by the major departments concerned. They will also define the permissible distribution of these electives among humanities, the student's major field, cognate fields, and others.

**Degree/Diploma Honors** – Diploma honors will be granted to degree recipients on the basis of the student's record for all course work in the degree program at Lawrence Tech. Only courses taken at the University qualify for honor point credits.

The words *Cum Laude* will be inscribed on the diploma provided the graduate has

earned a grade point average of at least 3.25. The words *Magna Cum Laude* will be inscribed if the graduate has earned a grade point average of at least 3.50. The words *Summa Cum Laude* will be inscribed if the graduate has earned a grade point average of at least 3.75.

For Associate degrees, a transfer student must have completed a minimum of 30 semester hours at Lawrence Tech to be eligible for diploma honors.

For Bachelor's degrees, a transfer student must have completed a minimum of 60 semester hours at Lawrence Tech to be eligible for diploma honors.





## COURSE NUMBER AND LEVEL

On the pages of course descriptions that follow, each course is identified by an alphanumeric course number. The alphabetic prefix represents the subject area.

### College of Architecture and Design

Architecture	ARC
Imaging and Graphic Design	ART
Interior Architecture/Design	ARI
Facility Management	ARM

### College of Arts and Sciences

Accounting	ACC
Biology	BIO
Botany	BOT
Chemistry	CHM
Communications	COM
English as a Second Language	ESL
Finance	FIN
Geology	GLG
Human Resource Management	HRM
Language and Literature	LLT
Management	MGT
Management Information Systems	MIS
Marketing	MKT
Mathematics and Computer Science/Math Co-op	MCS
Operations Management	OPM
Physical Science	PSC
Physics	PHY
Psychology	PSY
Science Education	SCE
Cooperative Science Education	SCO
Social Sciences	SSC

### College of Engineering

Civil Engineering	ECE
Construction Engineering Technology	TCE
Electrical and Computer Engineering	EEE
Electrical Engineering Technology	TEE
Electrical Contracting Technology	TEC
Engineering Co-Op	ECO
General Engineering	EGE

Manufacturing Engineering Technology	TIE
Mechanical Engineering	EME
Mechanical Engineering Technology	TME
Technology Co-Op	TCO
Technology Operations Management	TOM

### College of Management

Accounting	ACC
Finance	FIN
Human Resource Management	HRM
Information Technology	INT
Industrial Operations Management	MIO
Management Information Systems	MIS
Marketing	MKT
Operations Management	OPM

The first number following the alpha prefix indicates the academic level of the course: 0 = Basic Studies, 1 = Freshman, 2 = Sophomore, 3 = Junior, 4 = Senior, 5 = Senior/Grad, 6 and above = graduate level. Basic Studies courses (course level zero) normally do not provide degree credit. The last of the four numbers normally indicates the semester hours of credit assigned to the course. For example, ARC4653 carries three hours credit.

### REQUIREMENTS FOR GRADUATION/GRADUATION DEADLINE

Petitions for graduation for each semester have specific due dates. Students must contact the Office of the Registrar for these dates. It is the student's responsibility to be aware of these dates and adhere to them.

Processing of petitions after that date, if approved by the Office of the Registrar, requires that a substantial processing fee be assessed to the student. Further, availability of caps, gowns, and diplomas in time for commencement cannot be guaranteed.

A Petition for Graduation must be submitted one calendar month preceding the date of expected graduation. Students planning to participate in the commencement ceremony must notify the Office of the Registrar by March 1.

A graduation fee is charged and is non-refundable after one academic year in the event the student does not complete requirements as planned. A new petition must be submitted in the event requirements for graduation are not completed before the end of the current academic year.

The University reserves the right to modify its graduation and other academic requirements as may be deemed necessary. It will be obligated only during the academic year of the student's registration by requirements published in the *Undergraduate Catalog* for that year.

### CATALOG OF ENTRY — LIMITATIONS

Although graduation requirements of the University may change while a student is enrolled, students are normally expected to meet the graduation requirements outlined in the *Catalog* that is in effect at the time they matriculate, as long as the courses are still offered by the University. Substitutions may be made for required courses that may no longer be available. However, if the new graduation requirements may be adapted to a student's current course of study without increasing his or her credit hour requirements or existing prerequisites, the new requirements shall prevail.

Students interrupting their studies for three calendar years or more must reapply for admission (see the Admissions section, Interruption of Studies, in this *Catalog*). If readmitted, the *Catalog* in effect at the time of readmission is used to determine graduation requirements.





## ABOUT THE COLLEGE OF ARCHITECTURE AND DESIGN

The College of Architecture and Design at Lawrence Technological University is among the 30 oldest schools of architecture in the United States. It was founded on the conviction that universal truths underlie all existence and provide the scientific and aesthetic foundation for the study of architecture as it relates to the service of humankind. These incorporate technology, the physical and social sciences, the arts, economics, and law.

Above all, Lawrence Tech's architecture curricula emphasize the human condition and focus on humankind as the primary beneficiary of all artistic and technological endeavors.

No single architectural style or philosophy, other than the pursuit of excellence in the comprehensive response to human needs, dominates the curricula of the College of Architecture and Design. To this end, the faculty are drawn from a broad spectrum of creative and technical backgrounds. Not only does this maximize the students' exposure to a variety of differing philosophies and ideals, but it also offers the student contact with respected practicing professionals who are leaders in their fields of endeavor.

Obviously, architecture cannot be created in isolation. Its full success depends on its supportive harmony with all creative disciplines. Therefore, Lawrence Tech emphasizes the study of an architecture that recognizes the interrelationship of technical, economic, social, environmental, and philosophical factors; and the College rejects any isolated or unilater-

**Dean:**  
**Glen S. LeRoy, FAIA, FAICP**  
 A129, Ext. 2805

### FACULTY COUNCIL

**ERIK HEMINGWAY**  
**GRETCHEN MARICAK**  
**ROCHELLE MARTIN**  
**TOM NASHLEN**  
**PAUL WANG**

### Advisory Council - Architecture:

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 faculty, Lawrence Technological University  
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 president, Scarcello, Associates  
**DR. VIRGINIA NORTH, ASID, IIDA, IES, IDEC**  
 assistant dean – graduate studies, and department chair, Lawrence Tech  
**MARIA SIPOS, IDEC, IFMA**  
 assistant professor, Lawrence Technological University

### Advisory Council – Facility Management:

**BOB TEN BOSCH, CFM**  
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 principal, Key Management Services, Inc.  
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 manager, DaimlerChrysler  
**STEVE ORSARGOS, CFM**  
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**JIM PETTINATO**  
 manager, Valeo, Inc.  
**BRUCE WOODBURN, CFM**  
 property manager, Ford Motor Company  
**DR. VIRGINIA NORTH, ASID, IIDA, IES, IDEC**  
 department chair, Lawrence Technological University  
**MARIA SIPOS, IDEC, IFMA**  
 assistant professor, Lawrence Technological University

al science, philosophy, or art that inhibits the full development of a student's skills and ideals. Lawrence Tech educates architects, artists, designers and managers who are well prepared for the complex demands dictated by contemporary society.

The curricula of Lawrence Tech's College of Architecture and Design are structured in four undergraduate programs, a 36-credit Master of Architecture professional degree program, a post-professional degree program in architecture, and a Master of Interior Design.

Students are cautioned that course selection approval at the time of registration is based on stated prerequisite requirements and the student's ability to maintain adequate academic progress in collateral courses as indicated in the respective curriculum outlines.

A master plan of studies may be formulated by the student, in consultation with an advisor, based on a "Guide to Course Offerings," available in the College's administrative office.

For firsthand experience, great emphasis is placed on field trips that may be a part of any course offered by the College.

Transfer students are encouraged to enter any of the degree programs in which they have the interest and qualifications. When a complete or accurate description of previous course work is lacking, transfer students may be asked to present a portfolio of work, complete specific studio problems, or enroll in certain courses to ensure correct placement within the program.

Lawrence Tech's College of Architecture and Design is a member of the Association of Collegiate Schools of Architecture and the National Institute for Architectural Education. The M.Arch. professional degree program is accredited by the National Architectural Accrediting Board (NAAB). The Bachelor in Interior Architecture program is accredited by the Foundation for Interior Design Education Research (FIDER) and the National Association of Schools of Art and Design (NASAD). The Bachelor of Fine Arts in Imaging is also accredited by NASAD.

The following statements have been prepared by NAAB for inclusion in the catalogs of all architecture programs:

"In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards

Masters degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned

sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree."

## **BACHELOR OF SCIENCE IN ARCHITECTURE, BACHELOR OF INTERIOR ARCHITECTURE, BACHELOR OF FINE ARTS IN IMAGING, AND BACHELOR OF FACILITY MANAGEMENT**

These programs are unique in their emphasis on the relationship of all the disciplines that influence architecture.

All studies creatively integrate the sciences, humanities, and technologies with the design process. Each year's design studios build on course work previously assimilated, and all studio courses must be completed in strict sequential order. In broad terms, the programs are rooted in the rational subjective mastery of basic knowledge, the development of intuitive skill, and the maximization of the student's social and environmental awareness.

Year one is a foundation and introduction into the world of creativity, design and representation together with general education courses and specialized communications. Year two is a discovery of the integration of cultural awareness and the creative world through liberal studies and design methods, concepts and theories. In year three there is an exploration of thought and design philosophy through technological, analytical and conceptual integrations. Year four is an integration by the individual student of all previ-

ous design issues, and an opportunity for topic concentration through elective studios.

## **BACHELOR OF SCIENCE IN ARCHITECTURE**

The Bachelor of Science in architecture degree program is designed to provide a broad foundation for the development of social and environmental awareness, problem-solving ability and design creativity. This four-year preprofessional program prepares students for entry to a professional degree program for which high standards in academic performance will be required.

## **BACHELOR OF INTERIOR ARCHITECTURE**

The Bachelor of Interior Architecture degree program prepares people for careers in interior architecture and design through placing value and emphasis on technical, social, psychological, cultural, environmental, economical, spiritual, and physical factors to comprehensively respond to human needs. The program is integrated with the undergraduate program in architecture, providing students opportunity to experience the interrelationships among disciplines and the ability to examine a variety of design theories and philosophies. Critical thinking and creativity are important in the development of the person as well as the professional and are emphasized throughout the curriculum.



## BACHELOR OF FINE ARTS IN IMAGING

The Bachelor of Fine Arts in imaging degree program is based on a broad foundation in the fine arts and visual communication with application of a variety of media and techniques to achieve creative solutions to design problems. The program has two concentrations, *digital arts* and *graphic design*. The primary goal of these concentrations is to creatively apply the design process in development of hand drawing, graphic identities, Internet designs, photography, motion graphics, and other new emerging technologies to meet the needs of corporate and private enterprises. Elective courses are available within the College of Architecture and Design so students have opportunity to explore other creative disciplines. Elective courses are also available within the University in programs such as business, computer science, or engineering.

## BACHELOR OF FACILITY MANAGEMENT

The Bachelor of Facility Management program is designed to provide graduates with both a theoretical and practical exposure to a career in facility management. The curriculum blends courses in architecture, business, liberal arts, and facility management, and provides a theoretical foundation for people planning to continue their education with a graduate degree in business. Students engage in team-oriented projects where leadership and communication skills are emphasized. Practicing

professionals, most of whom are IFMA (International Facility Management Association) members, are involved in teaching facility management courses and participate on an active program advisory committee. All graduates are required to take a two-year co-op program in a facilities department where they apply their theoretical knowledge to real life situations and receive mentoring from practicing professionals. Graduates of this program have both national and international employment opportunities.

## DUAL DEGREES

Students may earn two degrees – the B.S. in Architecture and Bachelor of Interior Architecture – in as few as five years by carefully pre-planning course work. Qualified dual degree students may also earn a graduate degree, in addition to the dual degrees in a total of seven years through the careful structuring of course work. Students desiring dual degrees in architecture/interior architecture, architecture/civil engineering, architecture/construction management must consult with an advisor in the freshman year for assistance in properly sequencing course work.

## MASTER OF ARCHITECTURE PROFESSIONAL DEGREE

The 36-credit M. Arch. graduate degree program meets the academic credentials for professional licensing in the field of architecture established by



the National Architectural Accrediting Board (NAAB). A thesis is the focus of the program and is followed by the Master Class, taught by visiting professionals. In addition to the thesis and master class studios, required courses include research methods, environmental issues, architectural theory, professional practice, advanced liberal education courses and elective offerings available only to M.Arch. students.

The program emphasizes leadership qualities for future architects who may work in team orientations in professional practice or pursue non-traditional practice.

For detailed information on the graduate programs, see the *Graduate Catalog*.

## MASTER OF INTERIOR DESIGN

The 37-credit Master of Interior Design degree is a post-professional program aimed at people who hold an undergraduate degree in interior design. The program combines theory and issues with research and studio projects that allow intensive examination of an area of interest. The program features the Reflective Practice Studio taught by visiting practitioners.

## BACHELOR OF SCIENCE IN ARCHITECTURE

Total Semester credit hours: 132

### FRESHMAN YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
COM1103	English Composition	3
MCS1203	Logic	3
ARC1002	Art/Architecture Aware	2
ARC1113	Basic Design 1	3
ARC1213	Visual Com. 1	3
		15

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM2103	Technical & Prof. Com.	3
LLT1213	World Masterpieces 1	3
MCS1224	Intro. to Math Anal. 2	4
ARC1133	Basic Design 2	3
ARC1223	Visual Com. 2	3
		16

### SOPHOMORE YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1223	World Masterpieces 2	3
ARC3613	Hist. of the Des. Env. 1	3
PHY2213	College Physics 1	3
PHY2221	College Physics Lab	1
ARC2117	Integrated Design St. 1	7
ARC2813	Electronic Methods or equiv	3
		20

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
SSC2413	Found Am. Exp.	3
ARC3623	Hist. of the Des. Env. 2	3
PHY2223	College Physics 2	3
ARC2126	Integrated Design St. 2	6
ARC2131	Physics for Architecture	1
		16

### JUNIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
SSC2423	Devel. of Am. Exp.	3
ARC2313	Building Systems 1	3
ARC2514	Structures 1	4
ARC3117	Integrated Des Studio 3	7
		17

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC3413	Environmental Sys. 1	3
ARC2323	Building Systems 2	3
ARC3523	Structures 2	3
ARC3126	Integrated Des Studio 4	6
ARC2321	Building Syst. Global Lecture	1
		16

### SENIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC4114	Arch. Des. Studio 5	4
ARC4423	Environmental Sys 2	3
ARC4533	Structures 3	3
ARCXXX3	Architecture Elective	3
ARCXXX3	Architecture Elective	3
		16

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC4XX4	Allied Des. Studio or Arch. Studio Elective	4
ARC4543	Structures 4	3
ARCXXX3	Architecture Elective	3
ARCXXX3	Architecture Elective	3
LLT/SSC/PSY3XX3	Jr./Sr. Elective	3
		16

#### NOTES:

*ARC4183, Twentieth Century Architecture, is strongly recommended for all candidates for the M.Arch. professional degree program.*

*Students pursuing a dual degree (architecture/interior, architecture) must consult the program director to schedule course work. Dual degree status requires following the procedure outlined in the most recent edition of the Dual Degree Program policy statement, available from the chair, Department of Art & Design. To be official dual degree candidates, students must file a Dual Degree Declaration form with the chair of the Department of Art & Design.*

*See your academic advisor for elective requirements and further specific information on your degree program.*

#### ARCHITECTURE ADVISORS:

Edward Orłowski, 248.204.2850, orłowski@ltu.edu, room A129c  
 Leslie Michalik, 248.204.2819, michalik@ltu.edu, room A112  
 Virginia North, 248.204.2848, north@ltu.edu, room A129b

# COLLEGE OF ARCHITECTURE AND DESIGN

## BACHELOR OF FINE ARTS IN IMAGING

### Graphic Design Concentration

Total Semester Credit Hours: 131

#### FRESHMAN YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
COM1103	English Composition	3
SSC2413	Foundation of Am. Exp.	3
ARC1113	Basic Design 1	3
ARC1213	Visual Com. 1	3
ARC1002	Art/Architecture Aware	2
		15

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM2103	Technical & Prof. Com.	3
SSC2423	Develop. of Am. Exp.	3
MCS1254	Geometry in Art	4
ARC1133	Basic Design 2	3
ARC1223	Visual Com. 2	3
		16

#### SOPHOMORE YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1213	World Masterpieces 1	3
ART2223	Sketching for Illust.	3
PHY2213	College Physics 1	3
PHY2221	College Physics Lab	1
ART3633	Trad of Art 1	3
ART2813	Elec Meth for Image	3
		16

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1223	World Masterpieces 2	3
ART2233	Illustration Composition	3
PHY/CHM/BIO/GLG	elective	3
ART3643	Trad of Art 2	3
ART2623	Graphic Design 1	3
ART2523	Imaging Studio 1	3
		18

#### JUNIOR YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART3513	Graphic Design 2	3
Art/Arch.	History Elective	3
ART3213	Sculpture	3
Art/Arch/I.A.	Elective	3
ART3023	Photography	3
MCS/LLT/SSC/PSY/COM	Elective	3
		18

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART3523	Graphic Design 3	3
Art/Arch.	History Elective	3
ART3033	Digital Photography	3
ART3043	Video Imaging	3
	Elective	3
		15

#### SENIOR YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART4516	Graphic Design Thesis 1	6
ART4513	Graphic Design 4	3
ART3323	Portfolio Design	3
MGT2113	Intro to Business Law	3
ART3343	New Media	3
		18

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART4526	Graphic Design Thesis 2	6
ART4923	Internship Studies	3
Art/Arch/I.A.	Elective	3
LLT/SSC/PSY 3XX3	Jr./Sr. Elective	3
		15





## BACHELOR OF FINE ARTS IN IMAGING

### Digital Arts Concentration

Total Semester Credit Hours: 131

#### FRESHMAN YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
COM1103	English Composition	3
SSC2413	Foundation of Am. Exp.	3
ARC1113	Basic Design 1	3
ARC1213	Visual Com. 1	3
ARC1002	Art/Architecture Aware	2
		15

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM2103	Technical & Prof. Com.	3
SSC2423	Develop. of Am. Exp.	3
MCS1254	Geometry in Art	4
ARC1133	Basic Design 2	3
ARC1223	Visual Com. 2	3
		16

#### SOPHOMORE YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1213	World Masterpieces 1	3
ART2223	Sketching for Illust.	3
PHY2213	College Physics 1	3
PHY2221	College Physics Lab	1
ART3633	Trad of Art 1	3
ART2813	Elec Meth for Image	3
		16

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1223	World Masterpieces 2	3
ART2233	Illustration Composition	3
PHY/CHM/BIO/GLG	elective	3
ART3643	Trad of Art 2	3
ART2523	Graphic Design 1	3
ART2623	Imaging Studio 1	3
		18

#### JUNIOR YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART3613	Imaging Studio 2	3
Art/Arch.	History Elective	3
ARC3213	Sculpture	3
Art/Arch/I.A.	Elective	3
ART3023	Photography	3
MCS/LLT/SSC/PSY/COM	Elective	3
		18

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART3623	Imaging Studio 3	3
Art/Arch., ARM, IA	History Elective	3
ART3033	Digital Photography	3
ART3043	Video Imaging	3
	Elective	3
		15

#### SENIOR YEAR

##### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART4616	Imaging Thesis 1	6
	Elective	3
ART3323	Portfolio Design	3
MGT2113	Intro to Business Law	3
ART3343	New Media	3
		18

##### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ART4626	Imaging Thesis 2	6
ART4923	Internship Studies	3
Art/Arch/I.A., ARM	Elective	3
LLT/SSC/PSY 3XX3	Jr./Sr. Elective	3
		15

*An elective with four or more credit hours will count as only three credit hours toward the elective requirement.*

*See your academic advisor for elective requirements and further specific information on your degree program.*

#### ARCHITECTURAL IMAGING ADVISOR:

Virginia North, 248.204.2848, north@ltu.edu, room A129b

## BACHELOR OF INTERIOR ARCHITECTURE

Total Semester Credit Hours: 133

### FRESHMAN YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
COM1103	English Composition	3
SSC2413	Found. of Am. Ex.	3
ARC1002	Art/Architecture Aware	2
ARC1113	Basic Design I	3
ARC1213	Visual Com. 1	3
		15

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM2103	Technical & Prof. Com.	3
SSC2423	Devel. of Am. Exp.	3
MCS1254	Geometry in Art	4
ARC1133	Basic Design 2	3
ARC1223	Visual Com. 2	3
		16

### SOPHOMORE YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1213	World Masterpieces 1	3
ARC3613	Hist. of the Des. Env. 1	3
PHY2213	College Physics 1	3
PHY2221	College Physics Lab	1
ARC2117	Integrated Design St. 1	7
ARC2813	Electronic Method 1 or Equiv.	3
		20

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1223	World Masterpieces 2	3
ARC3623	Hist. of the Des. Env. 2	3
PHY2223	College Physics 2	3
ARC2126	Integrated Design St. 2	6
ARC2131	Physics for Architecture	1
		16

### JUNIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
MCS/SSC/LLT/PSY/COM	Elective	3
ARC2514	Structures 1	4
ARC2313	Building Systems 1	3
ARI3113	Furniture & Millwork	3
ARI3114	Interior Architecture 1	4
		17

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC3413	Environmental Sys. 1	3
ARC2323	Building Systems 2	3
ART2523	Graphic Design 1	3
ARI3124	Interior Architecture 2	4
ARI3122	Interior Materials	2
		15

### SENIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC4234	Allied Des: Inter. Arch.	4
ARI4223	Interior Design Practice	3
ARI4113	Hist of Inter. & Furn.	3
ARI4143	Advanced Lighting	3
ARC/ART	Elective	3
		16

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARI4353	Preservation Technology	3
ARI4922	Internship Studies	2
ARI4123	Environmental Psych.	3
ARI4134	Interior Architecture 3	4
ARC/ART	History Elective	3
LLT/SSC/PSY3XX3	Jr./Sr. Elective	3
		18

#### NOTES:

Both electives required for the Bachelor of Interior Architecture must be architecture electives – any three-credit course beginning with ARC or ART, except those required in the Bachelor's program of IA. A course with four or more credit hours counts as only three credit hours toward the elective requirement. The remaining elective must be a three credit, junior or senior level LLT/SSC/PSY course.

Students pursuing a dual degree (IA/AR) must consult the chair, Department of Art and Design.

See your academic advisor for elective requirements and further specific information on your degree program.

#### INTERIOR ARCHITECTURE ADVISOR:

Virginia North, 248.204.2848, north@ltu.edu, room A129b



## BACHELOR OF FACILITY MANAGEMENT

Total Semester Credit Hours: 129

### FRESHMAN YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
ARC1012	Art/Architecture Aware	2
COM1103	English Composition	3
ARC1213	Visual Com 1	3
ARC1113	Basic Design 1	3
SSC2413	Found of Amer Exper	3
		15

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM2103	Technical & Prof. Com	3
MCS1254	Geometry in Art	4
ARC2813	Electronic Methods 1	3
ARM2003	Intro Facility Mgmt	3
ARC1133	Basic Design 2	3
		16

### SOPHOMORE YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1213	World Masterpieces 1	3
SSC2423	Dev of Amer Experience	3
PHY2213	College Physics 1	3
PHY2221	College Physics 1 Lab	1
ARM2013	Intro to Interiors & Light	3
ACC2013	Accounting Principles 1	3
		16

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
LLT1223	World Masterpieces 2	3
MCS/SSC/LLT/PSY/COMXXX3		3
PHY2223	College Physics 2	3
MGT2203	Mgmt & Supervision	3
SSC2323	Micro Economics	3
ARC/ART/ARI	Elective	3
		18

### JUNIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC2313	Building Systems 1	3
HRM3043	Org Dev & Macro Chg	3
HRM3013	Organizational Behavior	3
TIE2123	Project Management	3
ARC2514	Structures 1	4
ARM1000	Co-op	0
		16

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARC/ART/ARI	Elective	3
ARC2323	Building Systems 2	3
ARC3413	Enviro Cntrl Systems 1	3
ARM3213	Intro to Facility Safety	3
MGT2113	Business Law	3
ARM1001	Co-op	1
		16

### SENIOR YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARM4523	Property Development	3
ARC4423	Enviro Cntrl Systems 2	3
ARM4513	Relocation Management	3
HRM3053	Managing Business Relations	3
ARC4403	Built Enviro Tech Mgmt	3
ARM2000/3000	Co-op	0
		15

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
ARI4123	Environmental Psychology	3
ARM4533	Operations & Maintenance	3
HRM3073	Comm. for Business Leaders	3
ARM4554	Senior Project (Capstone)	4
ARM2001/3001	Co-op	1
LLT/SSC/PSY3XX3	Jr/Sr Elective	3
		17

#### NOTES:

See your academic advisor for elective requirements and further specific information on your degree program.

#### FACILITY MANAGEMENT ADVISOR:

Virginia North, 248.204.2927, email north@ltu.edu, room A129b



## DEPARTMENT OF ARCHITECTURE

### Professors:

James Abernethy, emeritus  
William S. Allen  
Virginia North  
John V. Sheoris, emeritus

### Associate Professors:

Daniel L. Faoro  
Erik M. Hemingway  
Gretchen Maricak  
Rochelle Martin  
Thomas J. Nashlen  
Edward M. Orłowski (chair)  
Danny Price

### Assistant Professors:

Dale A. Gyure  
Joongsub Kim  
Janice K. Means  
Steven G. Schneeman

### Lecturers:

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.

### College Professor:

Paul Wang



## PRE-COLLEGE COURSES

Offered during the spring semester, the pre-college program invites exceptional high school juniors and seniors (with a “B” average or better) to explore the many facets of a career in architecture, interior design, or imaging. Guest lectures by artists and architects supplement studio classes in basic design and visual communication. Upon completion with a “C” or better, these courses transfer as college credit for possible advanced placement in the B.S. in architecture, interior architecture, or B.F.A. in imaging programs.

ARC0113 Basic Design 3  
ARC0213 Visual Communication 3

### ARC0113 BASIC DESIGN

*Prerequisite: 0.* Observation, analysis, and application of visual imagery and the principles and elements of design in the creation of two-dimensional, achromatic, design compositions using dry media. Principles include: balance, rhythm, repetition, gradation, structure, transparency,

texture, contrast and proportion. Introduction to design methodology and visual/verbal techniques necessary for design conceptualization and presentation. Studio 6 hrs. *3 hours credit. (Upon successful completion, with a grade of “C” or better, this course will transfer into Lawrence Tech’s undergraduate programs in place of ARC1113 Basic Design 1.)*

### ARC0213 VISUAL COMMUNICATION

*Prerequisite: 0.* Development of basic skills in the use of techniques for architectural drafting and sketching, including two-dimensional graphics, perspective, shades and shadows, model construction, and basic delineation. Studio 6 hrs. *3 hours credit. (Upon successful completion, with a grade of “C” or better, this course will transfer into Lawrence Tech’s undergraduate programs in place of ARC1213 Visual Communications 1.)*

## ARCHITECTURE COURSES

### ARC1012 ART/ARCHITECTURE AWARENESS

*Prerequisite: 0.* Introduction to the field of architecture, art, and design, including the creative process, architectural expression, history/theory, technology, and electronic digital media. Lecture 2 hours. *2 hours credit*

### ARC1113 BASIC DESIGN 1

*Prerequisite: 0.* Observation, analysis and application of visual imagery and the principles and elements of design in the creation of two-dimensional, achromatic design compositions. Principles include balance, rhythm, repetition, gradation structure, transparency, proportion and contrast. Introduces color theory and application, design methodology, and visual/verbal techniques necessary for design conceptualization and presentation. Studio 6 hrs. *3 hours credit*

### ARC1133 BASIC DESIGN 2

*Prerequisite: ARC1113.* Observation, analysis, and application of visual imagery and the principles and elements of design in the creation of three-dimensional compositions. Form and spatial enclosure; color, light and illusion; modularity and modulation; and an introduction to basic concepts of structural and sculptural forms. Further instruction in visual/verbal skills. Studio 6 hrs. *3 hours credit*

### ARC1213 VISUAL COMMUNICATIONS 1

*Prerequisite: 0.* Development of basic skills in the use of techniques for architectural drafting and sketching, including two-dimensional graphics, perspective, shades and shadows, model construction, basic delineation and drawing from observation. Introduction to methods of drafting, freehand drawing and electronic digital media to develop visualization skills. Studio 6 hours. *3 hours credit*

**ARC1223 VISUAL COMMUNICATIONS 2**

*Prerequisites:* ARC 1012, ARC 1213. Enhancement of freehand and electronic digital skills and techniques in pursuit of visualizing three-dimensional form and space on a two-dimensional field. Multimedia applications to illustrate design solutions through comprehensive understanding of one and two point perspective, color, light, shade-shadow, texture, and composition. Studio 6 hours. 3 hours credit

**ARC2117 INTEGRATED DESIGN STUDIO 1**

*Prerequisites:* ARC1133, ARC1223. An integrated design studio with components of Architectural Design (3 cr), Site Design (2 cr), Architectural Theory/Analysis (1 cr) and Forum (1 cr). A discovery of the integration of cultural awareness and the design of the built environment through an introduction to architectural design principles, processes and methods, as well as site design and architectural theory. Site/landscape design in a studio, and as part of the Forum lecture series, focuses on the physical elements of a site, their influence on site development and their effect on the architectural design. Fundamental aspects of architectural thought in architectural theory and analysis. Lect. 2 hrs., Studio 10 hrs. 7 hours credit

**ARC2126 INTEGRATED DESIGN STUDIO 2**

*Prerequisites:* ARC2117, ARC2813 or CAD experience. An integrated design studio with components of Architectural Design (3 cr), Interior Architecture (2 cr), and Lighting (1 cr). Development of architectural design principles, theories, processes, and cultural awareness emphasizing the qualitative relationships between elements and an introduction to

behavioral and psychological theories as they relate to experiencing the built environment. Elements of interior architecture and lighting are incorporated as an integral part of the architectural design experience. Interior planning includes space planning, color theory, lighting, ergonomics, and anthropometrics. Studio 12 hrs. 6 hours credit

**ARC2131 PHYSICS FOR ARCHITECTURE**

*Co-requisite:* PHY2223. Study of thermal, optical, electrical phenomena along with investigation of form development and structure and introduction to software manipulation of images (Adobe Photoshop) through laboratory and studio exercises applying principles of physics as specified architectural problems. Lab. 2 hrs. 1 hour credit

**ARC2223 INTRODUCTION TO ARCHITECTURAL MODELS**

*Prerequisites:* ARC1133, ARC1223. Students fabricate and study architectural scale models ranging from full size construction detail mock-ups to 1”/100 site studies. Models of interior space and form are included. Combinations of materials and fabrications methodology studied and practiced. Emphasis on craft quality and appropriateness of representation. The impact of material and scale choices through various assignments, such as variations in model scale or modeling materials to gain insights into the significance such choices have on perception. Lect. 1 hr., Studio 4 hrs. 3 hours credit

**ARC2313 BUILDING SYSTEMS 1**

*Prerequisites:* CAD course or proof of proficiency and ARC2126. An intensive studio focusing on building materials and processes as they relate to construction document preparation of a multi-story, light frame building. Emphasis on the nature, development, and properties of materials and systems most often selected for this type of construction. Selection includes consideration of various structural systems, circulation methods, as well as geographical, climatic and safety issues. Construction materials studied include wood, concrete, brick, and glazed ceramic products. Projects incorporate the study of current zoning ordinances, building codes, and ADA as well as required field trips. Sem. 3 hrs., Studio 3 hrs. 3 hours credit

**ARC 2321 BUILDING SYSTEMS GLOBAL LECTURE**

*Prerequisites:* ARC2313, ARC2126; *Co-requisite:* ARC2323 (for architecture majors only). Focuses on building materials and processes as they relate to the fabrication of multi-story, steel frame, and reinforced concrete frame buildings. Faculty and industry representatives provide background and detail on the nature, development, and properties of materials and systems that are most often selected for this type of construction, including process and criteria leading to the selection of appropriate building materials and systems for specific applications. Lect.1 hour 1 hour credit

**ARC 2323 BUILDING SYSTEMS 2**

*Prerequisites:* ARC2813 or CAD proficiency, ARC2313, ARC2126; *Co-requisite:* ARC2321 (for architecture majors only). A continuing intensive studio focusing on building materials and processes as

they relate to construction document preparation for multi-story, steel frame, and reinforced concrete frame buildings. Emphasis on the nature, development, and properties of materials and systems that are most often selected for this type of construction. The process leading to the selection of structural, mechanical, enclosure, and various interior building systems. Construction materials studied include structural steel, reinforced concrete, built-up and single-ply roofing, aluminum and glass cladding, and concrete masonry. Projects continue the study of zoning ordinances, building and national codes, and environmental concerns. Field trips are part of the course requirements. Seminar 3 hrs, Studio 3 hrs. 3 hours credit

**ARC2514 STRUCTURES 1**

*Prerequisite:* PHY2213, MCS1224 or MCS1254. Structural theory: statics by analytical and graphical solutions. Determination of loads, resolution of force systems, and equilibrium analysis. Structural properties of shape (centroids, moment of inertia) and materials (stress, stiffness, modulus of elasticity). Shear and bending moments, deflection, column theory, elementary indeterminate structures, and introductory awareness of structural system behavior. Introduction to the structural design process. Lect. 4 hrs. 4 hours credit

**ARC2803 MICRO-COMPUTER IN ARCHITECTURE**

*Prerequisite:* COM2103. The integrated use of architectural computer applications through the use of micro-computers. Preparation and program application, employing personal computers to produce graphical and alpha-numeric data.

Production of informational analysis, report generation, and presentation techniques. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**ARC2813 ELECTRONIC METHODOLOGIES 1**

*Prerequisite: 0.* Introduces the use of the computer to graphically generate databases as an aid in planning, management and design processes related to architecture and presentation. Introduces system design, project work flow, project organization, integration, networking and an awareness of Geographic Information System (GIS) database technology. Includes application theory and related terminology, with various CAD systems and analysis programs available to the architect/engineer. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**ARC3011-14 DIRECTED STUDY**

*Prerequisites: Junior standing, minimum GPA of 2.50 and written approval of the dean prior to registration.* Research or project on a selected architectural or environmental topic of interest, pursued under the close supervision of, and interaction with, an assigned faculty member. The topical study must not reiterate the content associated with any other course listed in the Catalog. The project or research topic may be undertaken as either an individual or team effort. (Note: Students must provide written "Plan of Study" for approval by the dean and faculty advisor prior to registration.) *1-4 hours credit*

**ARC3117 INTEGRATED DESIGN STUDIO 3**

*Prerequisites: ARC2126.* An integrated design studio with components of Architectural Design (4 cr), Urban Spatial Structure (2 cr),

and Landscape Design Global Lecture (1 cr). An exploration of meaning in architecture generated by cultural, political, and philosophical determinants.

Architecture, planning, urban design, and landscape design are studied through an analysis of the intentions, values, and priorities to human needs. Urban spatial structure involves a theoretical study of urban forms and land uses, with organizational principles, patterns, and interactions of a metropolitan area. Topics include an in-depth study of landscape design elements from theory and practice. Lect. 1 hr., Studio 12 hrs. *7 hours credit*

**ARC3123 FURNITURE DESIGN**

*Prerequisite: ARC2126.* Survey of western furniture design and fabrication since the Industrial Revolution. Materials and methods of construction. Several design studio problems culminate with student-made furniture. Lect. 1 hr., Lab. 1 hr., Studio 2 hrs. *3 hours credit*

**ARC3127 INTEGRATED DESIGN STUDIO 4**

*Prerequisites: ARC3117, ARC2313, ARC2514.* An integrated design studio with components of Architectural Design (4 cr), and Urban Spatial Structures (2 cr). A broadening of the inquiry of meaning through values as they relate to time, place, human needs and values. Aspects include design and structure through technological, analytical, and conceptual integrations. Urban spatial structure includes planning methods, and the role of government agencies in shaping the urban environment, development costs, environmental impact analysis, legal considerations and governmental review procedures. Lect. Studio 12 hrs. *6 hours credit*



**ARC3133 AIRBRUSH ILLUSTRATION**

*Prerequisite: Junior standing.* Fundamentals of illustration with the airbrush, including history, equipment selection, handling and materials. Basic control skills and exercises support the development of expressing textures, surfaces and entourage. Continued study of the effects of mood and composition support individual interpretations of architectural imagery. Lect. 2 hrs., Studio 4 hrs. *3 hours credit*

**ARC3143 GEOGRAPHIC INFORMATION SYSTEM METHODOLOGY**

*Prerequisite: Junior standing.* A comprehensive study of GIS technology and commercial software. Use of modeling and statistical tools for analysis of patterns and trends in database compilation. Through applications, the student develops critical thinking skills as they relate to projects in urban planning and analysis. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**ARC3413 ENVIRONMENTAL SYSTEMS 1**

*Prerequisite: PHY2223, ARC2131, ARC2126.* Basic electrical theory as it relates to building construction, electrical problems in power and distribution. Illumination design, natural and artificial sources, and energy conservation. Theory and analysis of architectural acoustics, room acoustics, sound isolation (indoor/outdoor), sound absorption and electronic sound reinforcement. Study of speech privacy, speech clarity and music spaces. Acoustical properties of materials. Lect. 3 hrs. *3 hours credit*

**ARC3523 STRUCTURES 2**

*Prerequisite: ARC2514.* Analysis and design of different steel members in tension, compression, and bending using AISC Code. Analysis and design of beam-columns. Design of welded and bolted connections. Lect. 3 hrs. *3 hours credit*



**ARC3613 HISTORY OF THE DESIGNED ENVIRONMENT 1**

*Prerequisite:* 0. History and philosophy of architecture in a context of related arts, crafts, and designed setting, studied in significant periods of the western world of antiquity, the Middle Ages (including Byzantine and Islamic extensions), and the Renaissance and Baroque eras. Lect. 3 hrs. 3 hours credit

**ARC3623 HISTORY OF THE DESIGNED ENVIRONMENT 2**

*Prerequisite:* ARC3613. History and philosophy of architecture and related design studied in significant periods in Asian, Pre-Columbian cultures and in the modern world from the 18th century. Lect. 3 hrs. 3 hours credit

**ARC3653 NON-WESTERN TRADITIONS OF ART AND ARCHITECTURE 1**

*Prerequisite:* 0. The artistic traditions of sub-Saharan Africa; Pre-Columbian Mesoamerica, South America and North America; Native North America; and Oceania. Emphasis on creating an understanding of the works of art within their cultural setting. Art and architecture presented in a unified way. Lect. 3 hrs. 3 hours credit

**ARC3663 NON-WESTERN TRADITIONS OF ART AND ARCHITECTURE 2**

*Prerequisite:* 0. Artistic traditions of the Indian sub-continent, China, and Japan. Emphasis on creating an understanding of the works of art within the cultural setting of these areas. The development of Hinduism, Buddhism, and Zen Buddhism is linked to their influence on both art and architecture. Lect. 3 hrs. 3 hours credit

**ARC3823 ELECTRONIC METHODOLOGIES 2**

*Prerequisite:* ARC2813. Introduces the use of the computer as a three-dimensional aid in the design process related to architecture and interior architecture. Solid modeling, isometric and perspective generation, interactive viewing, batch processing, and application theory. Special focus on the generation and manipulation of three-dimensional solid models. Computer graphic color rendering, multi-media workstations, computer animation, and virtual reality. Lect. 2 hrs., Lab. 2 hrs. 3 hours credit

**ARC3991-4 SPECIAL TOPICS**

*Prerequisite:* Sophomore standing. Experimental, special and timely projects undertaken by groups of students. A total of 8 semester credits may be earned, but no more than 4 in any one semester. 1-4 hours credit

**ARC4113 GREAT BOOKS OF ARCHITECTURE**

*Prerequisite:* Senior standing. From Vitruvius to the present, architects have recorded their ideas about design and building. A focus on texts written by architects. Participants discuss the writers' ideas and work in relation to its historical context. Readings drawn from the work of Vitruvius, Alberti, Palladio, Laugier, Sullivan, Loos, LeCorbusier, Aldo Rossi, Robert Venturi, Daniel Libeskin, Rem Koolhaas and other writers. Weekly reading assignments, a research paper, lectures, slides and discussion. Lect. 3 hrs. 3 hours credit

**ARC4114 ARCHITECTURAL DESIGN STUDIO 5**

*Prerequisites:* ARC3126, ARC2323, ARC3523. An integral architectural endeavor that synthesizes and builds upon the various design experiences of the previous years. Collective issues are integrated, including: programming, environmental concerns, structure, and building systems. Clarity of

thought and sensitivity of design are explored in design proposal format through the vehicles of writing and graphic portrayal as a means of professional communication. The instructor serves as both coach and facilitator. Projects are reviewed and evaluated by a jury from the architectural profession. Studio 8 hrs. 4 hours credit

**ARC4123 PROFESSIONAL AWARENESS**

*Prerequisite:* Junior standing. An overview of professional practice in the contemporary setting, combined with exploring career alternatives, the steps required for entry into a professional degree program, the internship years and licensure. Professional ethics and interdisciplinary professional relationships. Professionals will visit the classroom. Field trips. Reports, examinations and class participation measure the student's understanding of course objectives. Sem. 3 hrs. 3 hours credit

**ARC4124 ARCHITECTURAL DESIGN STUDIO**

*Prerequisite:* ARC3126 *Co-requisite:* as prescribed for specific projects. Traditional or specialized areas of architectural design. A reflective experience is nurtured by an increased cognizance of intrinsic architectural elements that help orchestrate the built environment. Individual instructors may elect to focus inquiry on a variety of issues that can provide a cornerstone for design development that is an essential step in the realization of architecture. Issues include aesthetic, psychological, environmental, structural, and construction. In addition, architectural projects may encompass certain pivotal allied design concerns. Studio 8 hrs. 4 hours credit

**ARC4133 PASSIVE SOLAR DESIGN STRATEGIES**

*Prerequisite:* ARC3413 or with instructor's permission. A comprehensive examination of the natural forces which impact the design of buildings. Environmental control systems for buildings with particular emphasis on passive solar design of heating, ventilating, daylighting, air conditioning systems, and other natural energy sources, their application and integration in the design of buildings. Lect. 2 hrs., Lab. 2 hrs. 3 hours credit

**ARC4163 THE AMERICAN HOME**

*Prerequisites:* ARC3613, ARC3623. The American house is a product of nearly four centuries of architectural innovation and experimentation. It has played a major role in the development of the American cultural landscape and has also become a fundamental symbol of the American dream. An exploration of the American home as an object signifying complex and often contradictory ideals of community and family, private and public life, originality and tradition, individualism and conformity, poverty and plenty. Course progresses more or less chronologically, beginning with the Colonial Era and concluding with manifestations of the contemporary domestic landscape. Lect. 3 hrs. 3 hours credit

**ARC4173 FRANK LLOYD WRIGHT AND HIS TIMES**

*Prerequisite:* ARC3623. The architecture, planning, and writings of Frank Lloyd Wright and his influence on contemporary architecture. Includes antecedent contributions of H.H. Richardson, Louis Sullivan, and the Chicago School, together with the context of other contemporary architectural philosophies. A special focus is the University-owned Affleck House designed by Wright during his Usonian period. Lect. 3 hrs. 3 hours credit

**ARC4183 TWENTIETH-CENTURY ARCHITECTURE**

*Prerequisite: ARC3623.* A historical and theoretical study of the transformation of European and American architecture in the 20th century. Study topics may include the effects of urbanism and suburbia, architecture of commerce and everyday life, and personal and political expression through building. Lect. 3 hrs. *3 hours credit*

**ARC4214 ALLIED DESIGN STUDIO: DESIGN DEVELOPMENT**

*Prerequisite: ARC3126.* Refinement in detail of a previous architectural design project. Emphasis on design development, integrated building systems, lighting design, code compliance, and issue resolution. Studio 8 hrs. *4 hours credit*

**ARC4223 THE BAUHAUS**

*Prerequisite: ARC3623.* A comprehensive study of the German design school as a culmination of pre-World War I approaches to modern design; as a self-contained creative institution; and as a primary influence on design principles after World War II. Lect. 3 hrs. *3 hours credit*

**ARC4224 ALLIED DESIGN STUDIO: SUSTAINABLE ARCHITECTURE**

*Prerequisites: Senior standing, ARC2323, ARC3413, ARC3126.* A design studio focusing on the study of sustainable building concepts, green architecture strategies and systems development with a particular focus on industrial architecture. The comprehensive design studio will encompass site and environmental planning, material and system selection, and integration of technology to create works that are functionally, aesthetically, and environmentally sound. Students will develop fully integrated design solutions. Studio 8 hrs. *4 hours credit*

**ARC4234 ALLIED DESIGN STUDIO: INTERIOR ARCHITECTURE**

*Prerequisites: Senior level in Architecture or Interior Architecture.* Synthesis of design principles, philosophies, and processes in developing solutions for a variety of interiors including residential interiors and health care facilities. Comprehensive application of the interior design process including programming, design development, detailing,

and documentation. Advanced techniques in graphic design will be applied along with electronic methods in 3-D design development and documentation of design solutions. Studio 8 hrs. *4 hours credit*

**ARC4244 ALLIED DESIGN STUDIO: LANDSCAPE ARCHITECTURE**

*Prerequisite: ARC3126.* An in-depth study of natural site elements and how they may be used to enhance the built environment aesthetically, functionally, and environmentally. Both pragmatic and theory-based approaches to the development of an actual project are employed as the core of course structure. An understanding of the balance among built, natural, and social environments as gained through case studies, existing projects, lectures and field trips. Studio 8 hrs. *4 hours credit*

**ARC4254 ALLIED DESIGN STUDIO: PRESERVATION ARCHITECTURE**

*Prerequisites: ARC3126.* Introduction to architectural and planning design elements including history, site development, building techniques, landscaping, measured drawings, and legal requirements. Studio projects create a historical link from the past to the future. Studio 8 hrs. *4 hours credit*

**ARC4264 ALLIED DESIGN STUDIO: URBAN DESIGN**

*Prerequisite: ARC3126.* Application of urban design and database technologies, theories, processes and methods to a current urban based project. Feasible design solutions are developed to the existing community problem and include physical planning, urban design and land use analysis utilizing GIS as well as graphic methods for public presentation. Studio 8 hrs. *4 hours credit*

**ARC4274 ALLIED DESIGN STUDIO: THEORY AND COMPETITIONS**

*Prerequisite: ARC3126.* Researching relevant issues of architectural thought in a studio contest. Because design competitions offer an effective means for bringing these issues to the architectural profession, studio assignment focuses on current competitions at the local, national and international levels. Readings, discussions, and critiques that enhance student work as well as acquaint students to the discourse of architecture. Studio 8 hrs. *4 hours credit*

**ARC4284 ALLIED DESIGN STUDIO: CAD**

*Prerequisites: ARC3126 and permission of instructor.* In association with the Architecture Computer Resource Center, students select an architectural office as a studio environment. An agreement is then established between the office and the College of Architecture and Design. Students develop design drawings while working for a minimum of 8 hours/week for the duration of the semester, and communicates electronically from the office environment to the design faculty in the College of Architecture and Design. Electronic communication includes transference of drawings and on-line critiques. Studio 8 hrs., Sem. 4 hrs. *4 hours credit*

**ARC4293 DESIGN SUPPORT ELECTIVE**

*Prerequisite: ARC3126* A broadening experience supporting the architecture or allied design elective component. The content and process lends enrichment, depth, and breadth to the concentration theme of the design elective through added learning dimensions which may include guest speakers, field trips, computer imaging, environmental and cognitive mapping. Studio 6 hrs. *3 hours credit*



**ARC4294 ALLIED DESIGN STUDIO: THEATER APPLICATIONS**

*Prerequisite:* ARC3126. The theater delineates issues of everyday life so they can be understood from another point of view, often refocusing situations with a new clarity. The opportunity to explore solid, void, light, color, shadow, decoration, and sound in performance as an extension of architecture. Students experiment with the interplay and interrelationship of these elements to illustrate a desired concept. Studio 8 hrs. 4 hours credit

**ARC4333 THE ARTS AND CRAFTS MOVEMENT**

*Prerequisite:* ARC3623. An examination of the Arts and Crafts movement in England and the U.S.; its development parallel to the evolution of Modernism; and the movements that grew from it in Europe. The work of key figures like Morris, Ashbee, Stickley, Hubbard, and Greene will be examined through architecture and the decorative arts. Lect. 3 hrs. 3 hours credit

**ARC4423 ENVIRONMENTAL CONTROLS 2**

*Prerequisites:* PHY2223, ARC3121, ARC2131. Human comfort, external and internal heat loss/gain, principles of heat transfer, fundamental thermodynamics, heating, ventilating and cooling equipment, system selection and sizing, spatial requirements, moisture migration and energy conservation. Plumbing systems overview, layout and fixtures. Fire protection overview, smoke control, automatic extinguishing systems and lighting protection. Lect. 3 hrs. 3 hours credit

**ARC4433 DESIGN FOR THE AGING**

*Prerequisite:* ARC2323. An intensive review of the technical, sociological, psychological and architectural issues that need to be considered when designing a building that integrates those issues accommodating the physical limitations of the aging. Emphasis on new residential unit design as well as adaptive reuse of existing residences to meet these needs. The process encourages problem-solv-

ing innovative approaches. The Americans with Disabilities ACT (ADA) is the basis for the technological considerations incorporated. Field trips. Professionals, technical experts and representatives of various organizations dealing with problems of the aging visit the classroom. Sem. 3 hrs. 3 hours credit

**ARC4533 STRUCTURES 3**

*Prerequisite:* ARC2514. Analysis and design of different concrete members using the ACI Code. Includes slabs, beams, girders and foundations. Also shear problems in beams and columns designed for axial load and bending moment. Stability analysis and design of retaining walls. Lect. 3 hrs. 3 hours credit

**ARC4543 STRUCTURES 4**

*Prerequisite:* ARC4533. Effects of continuity and indeterminacy on structures. Long-span structures, one-way and two-way systems (open-web joists, space frames). Effects of lateral forces (wind, earthquake) on building structures. Analysis and design of wood structures (joists, girders, columns). Lect. 3 hrs. 3 hours credit

**ARC4563 STRUCTURAL MASONRY DESIGN**

*Prerequisite:* ARC2514. Analysis and design of masonry building systems using unit masonry. Structural design of non-reinforced and reinforced masonry walls, beams, columns, etc. Design of non-load bearing structures as well as mid-rise load bearing structures with an emphasis on material properties. Lect. 3 hrs. 3 hours credit

**ARC4573 WOOD STRUCTURAL SYSTEMS**

*Prerequisite:* ARC2514. An expansion of general structural principles and methods of analysis developed from prior course work in statics and strength of materials concepts and structural theory regarding loading, and load condition on structural elements. Timber and engineered wood materials and standardized code (NDS) evaluations of structural members in linear frame systems and long span applications. Presented at both quantitative and qualitative levels. Lect 3 hrs. 3 hours credit

**ARC4623 JAPANESE ARCHITECTURE**

*Prerequisite:* Senior standing. Survey of Japanese architecture, both religious and secular, dating from neolithic pit houses to contemporary examples. Particular attention to wooden domestic and temple architecture from Japan's medieval age. Lect. 3 hrs. 3 hours credit

**ARC4833 CAD 3**

*Prerequisite:* ARC3823. The computer as a totally integrated aid in the design, planning and management process related to architecture. Application of two-dimensional and three-dimensional computer graphic skills, and data base generation and manipulation to the solution of an architectural design problem. Lect. 2 hrs., Lab. 2 hrs. 3 hours credit





**DEPARTMENT OF  
ART AND DESIGN**

**Professor:**  
Virginia North (chair)

**Associate Professors:**  
Thomas Regenbogen  
Steven Rost

**Assistant Professor:**  
Maria A. Sipos

**Senior Lecturer:**  
Gretchen Rudy  
Anthony J. Fisher

**Lecturers:**  
Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



**ART2623 IMAGING STUDIO 1**

*Prerequisites: ARC1133, ARC1223, and (ART2813 or ARC2813).* An exploration of new media and its impact on our visual world. The power of imaging through the introduction of conceptual, formal, and technical skills. Lect. 1 hr., Studio 4 hrs. 3 hours credit

**ART2813 ELECTRONIC METHODOLOGY FOR IMAGING**

*Prerequisites: ARC1133 and ARC1223.* Introduces the use of electronic media applied in digital imaging and graphic design. An introduction to system design, project work flow, project organization, networking and media integration. Includes theory, application, and related terminology relevant to imaging media. Lect. 2 hrs., Studio 2 hrs. 3 hours credit

**ART3023 PHOTOGRAPHY**

*Prerequisites: ARC1133, ARC1223.* The use of the camera and darkroom. Basic skills needed for visual and architectural communication and personal expression through black and white photography. Lect. 1 hr., Studio 4 hrs. 3 hours credit

**ART3033 DIGITAL PHOTOGRAPHY**

*Prerequisites: ARC1133, ARC1223, ART3023 or Department permission.* Builds upon experiences learned in the photography course. The digital photographic processes such as the digital camera and scanner dominate the coursework. Aesthetic, ethical, personal visual communication, contextual processes (altering) and design. Lect. 1 hr., Studio 4 hrs. 3 hours credit

**IMAGING**

**ART 1115 DESIGN ELEMENTS AND PRINCIPLES**

*Restriction: 4 + Interior Design and Architecture students only. Prerequisite: 0.* An examination of two-dimensional and three-dimensional design elements and principles. Studio work will allow students to explore design in a variety of media such as wood, metal, paper, paint, pencil, charcoal, markers, glass, and/or plastics, as well as electronic media. Application of the design process in creative development and presentation of design projects. Lecture 1 hour. Studio 6 hours. 5 hours credit

**ART 1225 VISUALIZATION TECHNIQUES**

*Restriction: 4 + Interior Design and Architecture students only. Prerequisite: 0.* A study of techniques used to visualize interior architectural designs. Studio experience will include drafting, free-hand drawing, sketching, model construction, axonometric and perspective construction, and

rendering in a variety of media. Lecture 1 hour. Studio 6 hours. 5 hours credit

**ART2113 LIFE DRAWING**

*Prerequisite: Sophomore standing or coordinator's approval.* Fundamentals of drawing the nude human figure in relationship to the attainment of representative abilities that result in the conscious development of expressive drawings. Use of line quality, exaggeration, distortion, and design to create unique interpretations of the figure and other illustration subjects. The individuality and expression of the subject are captured through dramatization of gestures and exaggeration of expressive qualities of subject attributes. 20th century art is presented as a means of understanding the range of possibilities of formal relationships. Studio 6 hrs. 3 hours credit

**ART2223 SKETCHING FOR ILLUSTRATION**

*Prerequisite: Sophomore standing or coordinator's approval.* The evolution of quick, definitive sketch ideation and illustration processes where speed and clarity are of chief importance. This approach results in the conscious

development of expressive drawing. Demonstrations and timed assignments utilize traditional graphic media such as markers, graphite and ink. Studio 6 hrs. 3 hours credit

**ART2233 ILLUSTRATION COMPOSITION**

*Prerequisite: Sophomore standing or coordinator's approval.* Pictorial structure with emphasis on traditional as well as experimental or unusual compositional themes. Problem-solving, reference materials, story-telling, color, form, and texture through both individual interpretation and established foundations. Studio 6 hrs. 3 hours credit

**ART2523 GRAPHIC DESIGN 1**

*Prerequisites: ARC1133, ARC1223, and (ART2813 or ARC2813)* Exploration of the evolution, components and techniques that make up graphic design. Awareness of the universal development of graphic design through its history, the principles of typography, and the essentials of visual communication in the form of publishing and printing. Application of current graphic design technology. Lect. 1 hr., Studio 4 hrs. 3 hours credit



**ART3043 VIDEO IMAGING**

*Prerequisite: ART2813 or ARC2813.* Introduces the making and editing of digital video. Developing a framework for exploration of unique interests in the creation of video as well as sound for video. Critical approach to issues in video such as conceptual, spatial, lighting, sound, movement, sequencing, and technical. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3113 ILLUSTRATION WITH WET MEDIA**

*Prerequisite: Junior standing or coordinator's approval.* The exploration of a variety of wet media with a focus on architectural subject matter. Images include the study of architectural entourage and its support of scale. The use of natural light, aspects of reflection and the interplay of light and shadow are emphasized. Studio 6 hrs. *3 hours credit*

**ART3123 ARCHITECTURAL PHOTOGRAPHY**

*Prerequisite: ART3023.* Architecture and photography have much in common; playing on our senses through motion and containment, through our sense of time and sense of place, and through memory. Projects investigate the relationship between architecture and photography, specifically addressing the interconnectedness of perception,

space, scale, and history. Through the synthesis of materials and presentation, students translate ideas and meaning as they might relate to current issues within their design studio. Lect. 2 hrs., Studio 1 hr., Lab. 1 hr. *3 hours credit*

**ART3133 INDUSTRIAL ILLUSTRATION**

*Prerequisite: Junior standing or coordinator's approval.* The illustration of transportation vehicles, products and furniture. Quick sketching and detailed design hand drawing are utilized. Computer imagery and hand drawing are explored, as well as a variety of media including marker, gouache, tempera and airbrush, both in sketch and detailed format. Studio 6 hrs. *3 hours credit*

**ART3213 SCULPTURE**

*Prerequisites: ARC1133, ARC1223.* Exploration of historical and contemporary techniques and opportunities available to the architect/artist to sharpen senses of proportion, scale, sequence, and sculptural structure through modeling, carving and casting processes. Both representational and abstract works in clay, plaster, wire, wood, plastic, and related materials are considered. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3313 ENVIRONMENTAL COLOR DESIGN**

*Prerequisite: Junior standing.* Studio projects and lectures based on real world objectives of aesthetics, color design, color materials and research. A comprehensive exposure to the nature of color composition and planning for architecture and the allied disciplines. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3323 PORTFOLIO DESIGN**

*Prerequisites: COM2103, Junior/Senior standing.* A comprehensive and intensive development into the creation of a senior portfolio in illustration and design. Under close supervision, students prepare portfolios which are analyzed for content and presentation. Emphasis on visual and verbal techniques of presentation, business practices/communication, the interview and fair practice agreements in the profession. Lect. 2 hrs., Studio 2 hrs. *3 hours credit*

**ART3343 NEW MEDIA**

*Prerequisites: ART2523 and ART2623 or Department permission.* Exploration of the interactive aspects of graphic design for the World Wide Web. A variety of media are explored with a focus on viewer interface and interaction. Students critique Web design from existing sites, and display their design portfolios on a Website they create. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3513 GRAPHIC DESIGN 2**

*Prerequisite: ART2523 or Department permission.* Graphics in the form of illustrations and photography are important components of graphic design. Creating and preparing visual imagery for their application in graphic communication in print and digital media. Projects utilize current graphic design technology to manipulate and create graphics in the form of stock art, digital

photography, informational graphics, digital illustrations, cartoons and time based graphics (animation.). Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3523 GRAPHIC DESIGN 3**

*Prerequisite: ART3513 or Department permission.* Development of all aspects of a marketing campaign using a prescribed branding message to create a visual identity through design of a logo, product packaging, and advertising in various formats. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3613 IMAGING STUDIO 2**

*Prerequisite: ART2623 or Department permission.* Principles of interactive imaging design and presentation with a focus on the planning, organization and design of three-dimensional content, as well as on user issues in the design of interactive digital imaging. Covers four main areas of interactive imaging design:  
1) Goals – Story Planning,  
2) Content – Model Constructing,  
3) Navigation – Visual Exploring and Editing, 4) Interface/Identity – Design Communication and Presentation. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART3623 IMAGING STUDIO 3**

*Prerequisite: ART3613 or Department permission.* Principles and elements of contemporary motion graphics for broadcast, web animation, architectural presentation, environmental art and film titles. Strategies and techniques of graphic storytelling, to develop ideas and structures, and design the surface of the motion. A secondary goal is to investigate the new digital tools to understand the practice of producing motion design for service-industry studios. The computer is used as the primary design tool. Focuses on active exploration of the use of different kinds of digital graphic tools in all phases of the motion graphic design process. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART 3633 TRADITIONS OF ART 1**

*Prerequisite:* COM1103. English Composition Painting, sculpture, and graphic arts in the western world from the Paleolithic period through the Gothic period and early non-western traditions of south and southeast Asia, China, Korea, Japan, the Middle East, Africa, Pre-Columbian Mesoamerica, South America, North America, and Native North America. Emphasis placed on understanding art within the larger cultural setting and in relation to architectural developments. Lecture 3 hours. *3 hours credit*

**ART 3643 TRADITIONS OF ART 2**

*Prerequisite:* COM1103. English Composition Painting, sculpture, and graphic arts in the western world from the early Renaissance period to the mid-twentieth century and later non-western artistic traditions of south and southeast Asia, China, Korea, Japan, the Americas, Oceania and Africa. Emphasis placed on the development of major styles and the work of major artists within the larger cultural framework of political, economic, geographic, and cultural trends. Techniques of art, the role of the artist and the relationship between art and architecture are covered. Lecture 3 hours. *3 hours credit*

**ART4513 GRAPHIC DESIGN 4**

*Prerequisites:* ART3523 *Graphic Design 3* or Department permission. Application of the procedures and processes of publishing through translating the written form into a coherent visual communication. Composition of type and images within the boundaries and limitations of publishing technology. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ART4516 GRAPHIC DESIGN THESIS 1**

*Prerequisite:* *Graphic Design majors only.* An opportunity to develop an independent thesis project in a graphic design subject. The project must be approved by graphic design faculty and the program chairman and is reviewed by visiting critics and academic staff. Studio 8 hrs., Sem. 2 hrs. *6 hours credit*

**ART4526 GRAPHIC DESIGN THESIS 2**

*Prerequisite:* ART4516. An opportunity to develop an independent thesis project in a graphic design subject. The project must be approved by graphic design faculty and the program chairman and is reviewed by visiting critics and academic staff. Studio 8 hrs., Sem. 2 hrs. *6 hours credit*

**ART4616 IMAGING THESIS 1**

*Prerequisite:* ARC3623. The thesis is independent design based on one digital imaging project developed in two phases. This course is the first phase of the thesis and provides opportunity to develop a proposal for the thesis in a digital imaging subject. Digital presentation of the results and investigation are required. The proposal must be approved by digital imaging faculty and the program chairman and is reviewed by visiting critics and academic staff. Studio 8 hrs., Sem. 2 hrs. *6 hours credit*

**ART4626 IMAGING THESIS 2**

*Prerequisite:* ART4616. The thesis is independent design based on one digital imaging project developed in two phases. This second phase of the thesis provides opportunity to build on the ideas established in the first phase (Senior Thesis 1) to determine a more specific and structured presentation as the result of the thesis. The project must be approved by digital imaging faculty and the program chairman and is reviewed by visiting critics and academic staff. Studio 8 hrs., Sem. 2 hrs. *6 hours credit*

**ART4923 INTERNSHIP STUDIES**

*Prerequisite:* ART3523 or ART3623. An internship work experience in the fields of digital imaging or graphic design. Students work under the direction of professionals in these fields and receive three semester credits for 300 hours of successful work performance. Internship positions must be approved by the department in advance. Sem. 1 hr. *3 hours credit*

**INTERIOR ARCHITECTURE**

**ARI3113 FURNITURE AND MILLWORK**

*Prerequisite:* ARC 2126. A thorough examination of furniture and millwork design and construction with emphasis on application of materials and components. Introduction to selection and specification of residential and non-residential furniture products with consideration of Universal Design principles and sustainability of products. Emphasis on application of CAD and CAP software in furniture space planning and specification. Lecture 1 hour. Studio 2 hours. *3 hours credit*

**ARI3114 INTERIOR ARCHITECTURE 1**

*Prerequisite(s):* ARC 2126. Integrated Design Studio 2 Interior architecture studio that comprehensively applies the design process to retail and hospitality projects. A focus on three dimensional design development through model building and computer modeling. Studio 8 hours. *4 hours credit*

**ARI3122 INTERIOR DESIGN MATERIALS AND COMPONENTS**

*Prerequisite:* 0. An examination of the properties of finish construction materials and components applied in interior design applications. An introduction to textiles is included. Lect. 2 hrs. *2 hours credit*

**ARI3124 INTERIOR ARCHITECTURE 2**

*Prerequisite(s):* ARI 3113 *Furniture and Millwork* and ARI 3114 *Interior Architecture 1* Interior architecture design studio that comprehensively applies the design process in developing office interiors. Application of computer software such as CAD, CAP, and Internet resources. Studio 8 hours. *4 hours credit*

**ARI4113 HISTORY OF INTERIORS AND FURNITURE**

*Prerequisite:* ARC3613 and ARC3623. A survey of interiors, furniture and decorative elements from ancient times to the present. Economic and social factors influencing interior design and furniture design of each period. Lect. 3 hrs. *3 hours credit*

**ARI4123 ENVIRONMENTAL PSYCHOLOGY**

*Prerequisite:* Senior standing. An exploration of the influences of environments on human behavior, including a study of the methods and tools used to evaluate psychological response and human needs. Sem. 3 hrs. *3 hours credit*

**ARI4134 INTERIOR ARCHITECTURE 3**

*Prerequisite(s):* ARI 3124, ARI 3122, ARC 2323, ART 2523. Synthesis of information learned in the Interior Architecture curriculum and applied to a significant interior project. The design process, including programming, design development, detailed design, specification, and graphic and written presentation, will be completed with emphasis on Universal Design principles, construction and detailing, integration of environmental systems, consideration of codes and laws, impact on the environment, and cost implications. Development of an original design approach based on theory and research will be reviewed and evaluated by a jury from design practice. Studio 8 hours. *4 hours credit*



**ARI4143 ADVANCED LIGHTING**

*Prerequisite: ARC3413.* A comprehensive study of lighting in building interiors, synthesizing design elements and principles with technical knowledge, in solving complex lighting design problems. Lect. 1 hr., Studio 4 hrs. *3 hours credit*

**ARI4223 INTERIOR DESIGN PRACTICE**

*Prerequisite: 0.* The study of the interior design profession; theoretical and practical functions of commercial/contract practice as a business including management, planning, marketing, or organizational structure, firm activities and scheduling, professional contract interior services and ethics, business liabilities and legal responsibilities. Sem. 3 hrs. *3 hours credit*

**ARI4353 PRESERVATION TECHNOLOGY**

*Prerequisite: Sophomore standing.* Historical development of the American building style as related to structural and material techniques, including technical methods of preservation, archaeological implications, building moving methods, maintenance and integration of mechanical systems. Lect. 3 hrs. *3 hours credit*

**ARI4922 INTERNSHIP STUDIES**

*Prerequisite: ARI3125.* Internship work experience in an interior design firm or the interior design department of an architectural firm for a minimum of 150 hours. Requires the presentation of a work log documenting the work experience. Regularly scheduled seminars and a final report plus a written assessment from the employer is required for class credit. Sem. 2 hrs. *2 hours credit*

**FACILITY MANAGEMENT**

**ARM1000 CO-OP PARALLEL PRACTICUM 1**

*Prerequisite: 2.25 LTU GPA and department approval.* First facility management co-op work experience. 300 hours required. Credit is given upon completion of ARM1001.

**ARM1001 CO-OP PARALLEL PRACTICUM 2**

*Prerequisite: ARM1000, 2.25 LTU GPA and department approval.* Second facility management co-op work experience. 300 hours required. Credit given on completion of both ARM1000 and ARM1001. *1 hour credit*

**ARM2000 CO-OP PARALLEL PRACTICUM 3**

*Prerequisite: ARM1001, 2.25 LTU GPA and department approval.* Third facility management co-op work experience. 300 hours required. Credit given upon completion of ARM2001.

**ARM2001 CO-OP PARALLEL PRACTICUM 4**

*Prerequisite: ARM2000, 2.25 LTU GPA and department approval.* Fourth facility management co-op work experience. 300 hours required. Credit given upon completion of ARM2000 and ARM2001. *1 hour credit*

**ARM2003 INTRODUCTION TO FACILITY MANAGEMENT**

*Prerequisite: ARC2813.* An introduction to facility management principles, practices and competencies. Lect. 3 hrs. *3 hours credit*

**ARM2013 INTRODUCTION TO INTERIORS AND LIGHTING**

*Prerequisite: 0.* An introduction to managing interiors, furniture, and lighting in facilities. The course will focus on open office systems furniture and lighting systems. LEED and Universal Design will be introduced. Lecture 3 hours. *3 hours credit.*

**ARM3213 INTRODUCTION TO FACILITY SAFETY AND SECURITY**

*Prerequisite: 0.* An examination of safety, security, and risk assessment methods in a variety of facilities. Personal and collective safety in the work place will be the focus through analysis of industry standards and case studies. Lecture 3 hours. *3 hours credit.*

**ARM4513 STRATEGIC FACILITY PLANNING AND RELOCATION MANAGEMENT**

*Prerequisite: 0.* Overview of strategic facility planning and tactical implementation through examination of the psychology of change management, senior management communication, financial justification, asset utilization, and performance metrics. Includes move management planning, data and communication system relocation, and facility and personnel issues related to relocation management. Lect. 3 hrs. *3 hours credit*

**ARM4523 PROPERTY DEVELOPMENT AND MANAGEMENT**

*Prerequisite: 0.* Overview of management of property development and understanding of documents pertaining to real estate. Includes: site selection, alternative methods of construction, landlord negotiations, leases, common area charges and building services. Lect. 3 hrs. *3 hours credit*

**ARM4533 OPERATION & MAINTENANCE**

*Prerequisite: 0.* Needs assessment, practices and standards used to evaluate building operating equipment with a focus on energy management and environmental issues. Establishing procedures for operating equipment standards and the importance of operations and maintenance in a variety of facilities. Lect. 3 hrs. *3 hours credit*

**ARM4554 SENIOR PROJECT**

*Prerequisite: 0.* Synthesis of knowledge of the nine areas of facility management competency through a comprehensive project involving actual facility related issues from cooperating companies. The project is completed and presented in groups or individually. Problem solving, critical thinking, leadership skills, teamwork and written and verbal communication skills are required. A wide range of communication techniques are applied to business case presentation. Sem. 4 hrs. *4 hours credit*

**NOTE: Cooperative Education in Facility Management**

*These cooperative courses provide a parallel program where the student works half time while taking classes at Lawrence Technological University. It is possible to take two of these courses in sequence during the summer semester. The completion of two courses is equivalent to one credit hour. Four co-op courses are required for the Bachelor of Facility Management degree program.*



## ABOUT THE COLLEGE OF ARTS AND SCIENCES

The goal of Lawrence Tech's College of Arts and Sciences is to develop in all students the ability to think critically, to solve problems creatively, and to make imaginative and rational decisions. The College prepares students for success at the University and for active, responsible, and creative lives. It cultivates the desire to excel in professional and personal endeavors and the ability to understand and work with people of various cultures.

In Arts and Sciences, teaching excellence comes first. Through its Core Curriculum students share a common experience encompassing the wide varieties of human thought. Instructors employ new learning technologies to teach the best in classical and contemporary thought and practice. The College is guided in all of its endeavors by its motto: "A Classic Education for a Technological World."

The College is committed to the enhancement of learning for people of all backgrounds and ages. It works for expanded educational and career opportunities for women and minorities. It offers programs for elementary and secondary school children and their teachers. It offers a range of programs that serve the professional community.

In all of its activities, the College is driven by its commitment to the primary value of free, informed choice as the

### Dean:

**HSIAO-PING H. MOORE**,  
S101, 248.204.3500

### Associate Dean:

**GLEN A. BAUER**, S101, 248.204.3500

### Faculty Council:

**SONIA HENCKEL**  
**BARRY W. KNISTER**  
**MARILYN V. RANDS**, council chair

### ARTS AND SCIENCES ADVISORY COUNCIL:

**ROGER A. BREKKEN**  
technology director,  
3M Automotive Industry Center

**GARY J. GABEL**  
president,  
Great Lakes Strategies

### FRED GOODMAN

professor of education,  
University of Michigan

### SISTER ROSE MARIE KUJAWA

academic vice president,  
Madonna University

### THOMAS F. MICH

vice president for chemical  
development,  
Parke-Davis and Company

### STANFORD R. OVSHINSKY

president,  
Energy Conversion Devices, Inc.

### JULIUS L. PALLONE

president,  
J. L. Pallone Associates -  
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### JUDITH PEARL

first vice president, systems  
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NBD Bank N.A.

### ROBERT L. RICHARDSON

president,  
Concept 28 Associates

### MICHAEL WIDER

director of new technology,  
Flint Ink Corporation

basis for responsible action. Complementing this goal, Arts and Sciences strives to foster civility in social relations – a civility that grows out of respect for the worth of all individuals.

## CORE CURRICULUM

The College of Arts and Sciences seeks to prepare students to grow intellectually and carry out fully their responsibility to those around them, whether in their families or in their public and professional lives.

The Core Curriculum provides a well-rounded educational experience for all Lawrence Tech students. Students encounter the greatest literary and philosophical works that humankind has produced and discuss them with professors in small classes. They explore the sciences in a hands-on laboratory environment, and gain a solid foundation in mathematics. Composition and communications courses develop a high level of accomplishment in speaking and writing.

## DEGREE PROGRAMS

The College provides degree programs in business management, chemistry, environmental chemistry, chemical technology, computer science, the humanities and social sciences, mathematics, radio and television broadcasting, physics, psychology, and technical and professional communication. Pre-medical and pre-dental programs are arranged through

the Department of Natural Sciences and pre-law through the Department of Humanities, Social Sciences, and Communication. University Studies provides special classes and services for students not yet ready to enter specific majors. In addition, the departments offer minors and dual majors (see descriptions included in individual program curriculum guides).

The departments continually develop courses and programs in response to social, economic, and technological changes. With a strong undergraduate education, Arts and Sciences graduates can prepare for immediate entry to professional life and for graduate or professional school.

## COMPUTER SCIENCE

The Bachelor of Science in computer science seeks to prepare students to enter a rapidly changing industry with unlimited potential for well-prepared graduates. In consultation with a faculty advisor, students can choose the mix of mathematics and computer science that best fits their backgrounds and objectives. The degree may be earned through one of three options: Option 1, with the most mathematics and science content, is excellent preparation for graduate school and for careers including scientific or engineering application development. Option 2 (business application), with less mathematics and science, provides excellent preparation for careers in business application development. Option 3 (network), with a focus on systems, is excellent preparation for a career in information systems design and implementa-

tion. Students can:

- create a program geared to their computer science interests;
- work with an outstanding faculty dedicated to student success, who will give one-on-one advising to help students reach their individual goals;
- participate in small classes that enhance interaction with teachers;
- learn in specialty labs in multimedia, computer graphics, distributed computing, and robotics;
- take part in cooperative projects and in classroom, state, and national competitions that promote interaction with fellow students;
- create links to employers through paid internships and projects while still in school.

The computer science program prepares graduates for exciting careers in application programming, distributed computing, data mining, game development, computer graphics, networking, Web applications, robotics, and intelligent systems, among others.

## MATHEMATICS

The Bachelor of Science in mathematics degree is designed for careers in the scientific and business community where the application of mathematical analysis leads to scientific or financial solutions. In this rapidly evolving world where job descriptions change, new technologies are introduced, and entire industries are transformed overnight, the analytical skills and the

mathematical principles on which technology and decision making are based remain constant. Mastering mathematical theories and their practical applications provides graduates with a competitive edge in any career. Students can:

- work with an outstanding faculty dedicated to student success, who will give one-on-one advising to help students reach their individual goals;
- participate in small classes that enhance interaction with teachers;
- prepare for graduate work in mathematics;
- participate in undergraduate research;
- engage in team-oriented experiences, including state and national competitions, designed to help students take part in, and lead, project teams on the job.

## MATHEMATICS AND COMPUTER SCIENCE

The Bachelor of Science in mathematics and computer Science degree offers the widest variety of career paths after graduation. It also provides the most rigorous preparation for higher-level problem solving and for graduate school. In addition to the advantages listed above for computer science, students can:

- gain experience in using advanced mathematical and computing tools to solve real-world problems;
- prepare for graduate work in either computer science or applied mathematics.



## **BUSINESS MANAGEMENT**

The Bachelor of Science in business management provides a strong foundation in business studies combined with a specialization of the student's choice and a broad liberal arts education. It is an excellent choice for transfer students who wish to gain maximum credit for courses already completed. Students can:

- learn from an outstanding faculty with extensive industry and academic experience;
- participate in small classes that encourage team building and personal interaction with their instructors and peers;
- gain expert advising from a faculty member in their program, maximizing opportunities at Lawrence Tech and creating a path for success after graduation;
- earn a bachelor's degree in 60 hours if they already have an associate's degree;
- take advantage of paid internships;
- participate in a network of links to professional organizations and industrial partners.

## **HUMANITIES**

The humanities curriculum allows students to organize their education to achieve a specific professional goal while receiving a solid liberal arts education that deepens intellectual development. The program can prepare students for varied careers, including

law, business, and public service. Students can:

- learn in classes taught only by qualified, experienced faculty who are experts in their fields;
- learn in small classes that encourage interaction with teachers and fellow students;
- receive careful mentoring;
- engage in discussion with students and faculty on a wide range of topics, including literature, art, music, philosophy, history, economics, film, and drama;
- gain a clear understanding of the power of humanistic learning in a society influenced by science and technology.

## **TECHNICAL AND PROFESSIONAL COMMUNICATION**

The Bachelor of Science in technical and professional communication seeks to prepare students for professional careers in written, oral, and computer-based communication. Graduates are prepared in the processes of communication and in an individually selected area of business or technology. Students:

- learn from outstanding faculty, experts and practitioners in their field;
- participate in small classes that enhance team-building and problem-solving skills;
- develop projects using state-of-the-art technology;
- gain experience as interns in business and industry; and
- network with communication professionals and corporate leaders.

*A Certificate in Technical and Professional Communication*, consisting of 15 semester hours of study, is available to Lawrence Tech degree candidates or to students enrolling specifically for the Certificate.

Students interested in proceeding beyond the Certificate level can complete additional coursework to earn a minor in technical and professional communication. Requirements for the minor include the courses required for the Certificate, plus three additional COM courses at the 3000 level or higher.

## **ASSOCIATE OF ARTS IN RADIO AND TELEVISION BROADCASTING**

A partnership between Lawrence Tech and Specs Howard School of Broadcast Arts makes it possible for students to earn their associate degree by combining the extensive practical knowledge gained at Specs Howard with courses from Lawrence Tech's core liberal arts curriculum and the University's Technical and Professional Communications program.

The goal of the AARTB program is to provide the capabilities needed for a successful career, including:

- Highly developed written and oral communication skills
- Advanced knowledge of collaborative and organizational communication practices used in team supervision and motivation

- A thorough understanding of rhetorical and ethical considerations that play a key role in broadcasting and news presentations
- Leadership and project management skills

## **PSYCHOLOGY**

Lawrence Tech's Bachelor of Science in psychology can prepare students for immediate entry into a variety of careers based on understanding human motivation and interaction. Psychology is one of the fastest growing professions. Lawrence Tech's psychology program offers three pathways into this exciting field:

*Pre-Clinical/General Psychology* – In this option, students receive the most broad-based understanding of individual and group psychology. After building a foundation in human development, social psychology, and abnormal psychology, they move to more specialized courses. Students can explore, for example, how people function in organizations, the apparently unconscious sources of animal behavior, and the causes of mental disability. Students study the old masters such as Freud and Jung as well as the most recent breakthroughs in neuropsychology, the matching of brain states with behavior. Psychology majors with bachelor's degrees are able to enter directly such fields as: advertising, law enforcement, marketing, sales, business administration, journalism, and public relations. Psychology graduates most often work in health-related fields and fre-

quently work in schools with children and adolescents. At the master's level, graduates may enter the fields of human development and applied social psychology as well as find a career in human services dealing with substance abuse, public health, family counseling, labor relations, or social work. A doctorate in psychotherapy enables graduates to help people confront mental and emotional problems and lead better adjusted lives.

*Industrial/Organizational Psychology* – By choosing this option, students can prepare to work in industry and business immediately after graduation. Students explore leadership, decision-making, motivation, cultural diversity in the workplace, job performance, and testing and training. Courses in psychology and in business administration combine theory and practice to provide a strong foundation for a career or for graduate school.

The demand is particularly strong for those able to combine graduate study in psychology with advanced business training. A doctorate in industrial psychology can lead to a prestigious and lucrative career.

Many doors will be open to graduates because Lawrence Tech's educational approach offers the highly desirable combination of computer savvy, mathematical training, management fundamentals, and a deep knowledge of psychology.

*Pre-Medical/Pre-Graduate School* – With a focus on preparation for medical school or for a career in psychological research, Lawrence Tech psychology program builds a solid

foundation in psychology; it also provides the rigorous training in science, mathematics, computers, and the humanities that are needed to excel on the MCAT or GRE.

This option fulfills the requirements for Lawrence Tech's pre-medical program. In fact, psychology, along with biology and chemistry, is one of the three most popular undergraduate majors for students applying to medical school. A psychology degree offers a distinct advantage, allowing later specialization in neurology or psychiatry, although all medical specialties are open.

Lawrence Tech graduates are especially well prepared to enter the fast-developing fields of neuropsychology and cognitive psychology, where computer programming, philosophy, and psychological probing are combined to explore the workings of the human mind.

## CHEMICAL BIOLOGY

Molecules large and small play a crucial role in the functioning of larger organisms. Recent advances in the life sciences and in biotechnology have created industries with a deep need for scientists and technicians who are well versed in both biology and chemistry. This dual knowledge – chemical biology – constitutes an emerging discipline that lies at the very core of the biotechnology industry. Lawrence Tech's Bachelor of Science in chemical biology is the first such program in the Midwest. Graduates of this unique interdisciplinary program are positioned to pursue careers in the pharmaceutical and biotechnology industries

as well as graduate work in chemistry, biochemistry, molecular biology and chemical biology. This curriculum also satisfies the requirements for admission to medical, dental or veterinary schools.

## CHEMISTRY/ENVIRONMENTAL CHEMISTRY

Lawrence Tech's programs in chemistry and environmental chemistry place a strong emphasis on laboratory experience. There are several options within the chemistry program at Lawrence Tech.

Graduates who choose the degree option certified by the American Chemical Society are broadly prepared to find employment in chemistry laboratories, research, industry, medicine, biochemistry, government and education. Students are also well positioned for subsequent graduate work in chemistry, biochemistry or materials science.

Graduates who select the engineering chemistry option receive preparation in both chemistry and engineering and may pursue positions in both traditional chemistry fields as well as many of those normally filled by chemical engineers.

The separate bachelor program in environmental chemistry offers preparation for careers in pollution prevention, hazardous waste management, chemical health and safety, environmental analysis, inspection and compliance, and the synthesis of biodegradable and photodegradable materials. It also allows students to enter graduate programs in environmental engineering and hazardous waste management.

In all these programs, stu-

dents can:

- design a program to meet career objectives;
- qualify to become skilled chemical laboratory professionals immediately following graduation;
- work with equipment and instrumentation offering preparation for real-world employment;
- acquire the computer and communication skills needed for success in chemistry and the life sciences;
- participate in small classes that foster interaction with teachers and fellow students; and
- be welcomed to an award-winning American Chemical Society student chapter.

## CHEMICAL TECHNOLOGY

Through the Associate of Science in chemical technology program, students have available the facilities and experiences, offered to students in the four-year chemistry program. This program is designed to be completed in only two years and will qualify students to work as a skilled technician alongside professional chemists and chemical engineers.

## PHYSICS/PHYSICS AND COMPUTER SCIENCE

The physics degree programs at Lawrence Tech place a strong emphasis on laboratory experience and the use of computers to prepare students for scientific study, research and development, and for medical, dental, and law school entrance. The programs also provide useful skills in prepa-

ration for immediate career opportunities. The Bachelor of Science in physics has many elective choices that enable students to design a degree to match their career goals in: lasers and holography, nuclear physics, biomedical engineering, geophysics, health physics and nuclear medicine, science education, patent law, and astronomy.

The *applied physics* concentration is featured for those who wish to work in research and development in industry and interdisciplinary research. The Bachelor of Science in physics and computer science can prepare students to apply computers and sensor technology to the solving of practical problems.

In any of these physics programs, students can:

- gain computer skills in Lawrence Tech labs that allow analysis of data gathered with interfaced sensors;
- design a program to meet career objectives;
- engage in a field leading to the exciting research that drives the technological revolution, from radio astronomy to lasers, medical imaging, and supercomputers;
- join the many past Lawrence Tech physics students who have gone on to the nation's top graduate programs in physics or related fields;
- participate in small classes where you interact closely with teachers and students
- find opportunities to participate as an undergraduate in special programs at national facilities, such as Oak Ridge, Argonne, Fermilab, and Los Alamos;

- acquire the communication skills necessary for a successful career.

## UNIVERSITY STUDIES

The Associate of Science in university studies is a two-year program designed for:

- students seeking a two-year liberal arts degree; or
- students who need to demonstrate proficiency at the university level to enter their major of choice.

Like all other majors within the College, students in university studies benefit from Lawrence Tech's outstanding faculty, small class sizes, structured core curriculum, state-of-the-art technology and impressive laboratory facilities. In addition, students will receive personal guidance from academic advisors genuinely interested in the needs and educational goals of each individual.

The program gives access to any of the baccalaureate programs at the University following the successful completion of a set of courses specific to University Studies. Students complete classes in a variety of subject areas, fulfilling the general education requirements common to all curricula at the University. While enrolled in university studies, students may also elect to take foundational courses within their intended majors.

The University Studies program at Lawrence Tech offers:

- a wide range of courses specifically designed for improving proficiency in key subject areas such as mathematics, science and communication;

- specially designed core courses, common to all Lawrence Tech degree programs, in which students develop the ability to think both critically and creatively;
- opportunities to complete selected courses in areas such as engineering, computer science, architecture and design, science, business, and others, in preparation for pursuing a four-year degree;
- an Academic Achievement Center that provides a wide range of tutoring and support services;
- access to Lawrence Tech's state-of-the-art computer and laboratory facilities.

## UNDECLARED

The College welcomes students interested in exploring their educational options prior to declaring a major. While completing general education courses common to all degree programs, undeclared students may also select from introductory courses in architecture, business, communication, computers, engineering, science, or any other discipline offered at the University as a way to learn more about these areas of study. Academic advisors and career services professionals will be available to assist students in selecting the major best suited to their interests and abilities.

## DEGREE REQUIREMENTS — COLLEGE OF ARTS AND SCIENCES

In addition to those given in the "Degrees and Graduation" section, the following requirements must be met. The specific courses that fulfill these requirements are shown in the curriculum outlines on the following pages.

### HUMANITIES, SOCIAL SCIENCES, AND COMMUNICATION

#### Business Management

Humanities	31 semester hours
Mathematics	8 semester hours
Statistics	3 semester hours
Science	7 semester hours
Management core	38 semester hours
Electives	34 semester hours
	<hr/>
	121 semester hours

#### Humanities

Humanities	70 semester hours
Computer Science	3 semester hours
Mathematics	8 semester hours
Science	7 semester hours
Electives	33 semester hours
	<hr/>
	121 semester hours

#### Psychology

Humanities	
Pre-Medical	25 semester hours
Pre-Clinical	28 semester hours
Industrial	28 semester hours



Psychology	
Pre-Medical	31 semester hours
Pre-Clinical	34 semester hours
Industrial	32 semester hours
Management core	
Industrial	9 semester hours
Science	
Pre-Medical	43 semester hours
Pre-Clinical	12 semester hours
Industrial	8 semester hours
Computer Science	3 semester hours
Mathematics	14 semester hours
Open Electives	
Pre-Medical	5 semester hours
Pre-Clinical	30 semester hours
Industrial	27 semester hours
	121 semester hours

### Technical And Professional Communication

Humanities	28 semester hours
Technical and Professional Communication core	51 semester hours
Science	7 semester hours
Computer Science	3 semester hours
Mathematics	14 semester hours
Open Electives	18 semester hours
	121 semester hours

### Radio and Television Broadcasting

Humanities	16 semester hours
Mathematics	4 semester hours
Science	4 semester hours
Communication Core	12 semester hours
Specs Howard Transfer	24 semester hours
	60 semester hours

### MATHEMATICS AND COMPUTER SCIENCE

#### Computer Science

Humanities	28 semester hours
Natural Science	7-8 semester hours
Mathematics	18-21 semester hours
Computer Science	47 semester hours
Electives	18-21 semester hours
	121-122 semester hours

#### Mathematics/Computer Science

Humanities	28 semester hours
Chemistry	4 semester hours
Physics	8 semester hours
Mathematics	42 semester hours
Computer Science	32 semester hours
Electives	6 semester hours
	120 semester hours

#### Mathematics

Humanities	28 semester hours
Chemistry	7 semester hours
Physics	8 semester hours
Mathematics	48 semester hours
Computer Science	9 semester hours
Electives	21 semester hours
	121 semester hours

### NATURAL SCIENCES

#### Chemistry (option dependent)

Chemistry	31-53 semester hours
Computer Science	2 semester hours
Humanities	28 semester hours
Mathematics	15 semester hours
Physics	8 semester hours
Engineering	0-30 semester hours
Open Electives	3-17 semester hours
	121-126 semester hours

#### Environmental Chemistry

Biology	4 semester hours
Chemistry	55 semester hours
Computer Science	2 semester hours
Geology	3 semester hours
Humanities	28 semester hours
Mathematics	15 semester hours
Physics	8 semester hours
Open Electives	6 semester hours
	121 semester hours

#### Chemical Biology

Chemistry	38-44 semester hours
Biology	22-28 semester hours
Humanities	28 semester hours
Mathematics	15 semester hours
Physics	8 semester hours
Computer Science	2 semester hours
Open Electives	6 semester hours
	112-131 semester hours

#### Physics/Computer Science

Physics	43 semester hours
Mathematics/Computer Science	47 semester hours
Humanities	28 semester hours
Chemistry	9 semester hours
	127 semester hours

#### Physics

Physics	36-47 semester hours
Mathematics/Computer Science	23-26 semester hours
Humanities	28 semester hours
Chemistry	9 semester hours
Electives	3-16 semester hours
	123-127 semester hours

### UNIVERSITY STUDIES

Humanities	23 semester hours
Natural Science	7 semester hours
Mathematics	7 semester hours
Computer Science	3 semester hours
Electives	20 semester hours
	60 semester hours

## FOUNDATION STUDIES AND SPECIAL PROGRAMS

### PRE-MEDICAL, PRE-DENTAL SEQUENCES

The following courses are recommended for medical school admission. A student should contact a particular medical school for specific details about its admission policies.

	<b>Biology</b>	<b>Sem. Hrs.</b>	<b>Lawrence Tech Courses</b>
	1 year of General Biology & Lab	8	BIO1213, BIO1221, BIO1223, & BIO1231
	1 Genetics course	3	BIO2323
	1 Microbiology course & Lab	4	BIO2313 & BIO2321
	<b>Chemistry:</b>		
	1 year of General Chemistry & Lab	9	CHM1213, CHM1221, CHM1223 & CHM1232
	1 year of Organic Chemistry & Lab	8	CHM2313, CHM2323 & CHM2332
	1 Biochemistry course (usually recommended)	3	CHM3403
	<b>Other Math &amp; Science Courses:</b>		
	1 year of Physics with Lab	8	University or College Physics Courses
	1 year of Mathematics with Calculus	8	MCS1414 & MCS1424; or MCS1214 & MCS1224
	1 or 2 courses of Statistics	6	MCS2023 or MCS3403 or MCS2113 & MCS2123

*These courses can most easily be satisfied with a B.S. in Chemistry, Psychology, Chemical Biology, or Physics, but can also be satisfied in various other majors with the appropriate choices of electives.*

### PRE-LAW

An advantage of the University's Core Curriculum is that it develops the habits of critical and logical thinking that are central to admission to, and success in, law school. In addition, students planning to attend law school should place the greatest emphasis on skill in both oral and written communication. Both the B.S. in humanities and the B.S. in technical and professional communication provide a thorough education in communication and critical thinking, skills essential to the study of law. The Humanities degree, especially, provides excellent preparation by offering a knowledge of the context and development of the U.S. system of law and government. Additional courses in four categories are particularly valuable to pre-law students:

<b>Law</b>	<b>Communication</b>
MGT2113 Introduction to Business Law	COM2113 Speech
SSC4143 Constitutional Law: Individual Rights	COM2443 Introduction to Rhetoric and Logic
	COM3103 Advanced Prof Communication
<b>History, Philosophy, and Political Science</b>	COM3463 Collaborative Communication
SSC3153 American History to 1877	COM3553 Interpers and Nonverbal Communication
SSC3163 American History since 1877	
SSC3173 American Political Tradition Business	<b>Business Management</b>
SSC3723 Ethics	ACC2013 Accounting Principles 1
SSC4133 Problems in International Politics	ACC2023 Accounting Principles 2
	FIN3013 Introduction to Financial Management
	MGT2203 Management and Supervision

**CONTACT PERSON:** Harold Hotelling, 248.204.3530, email: hotelling@ltu.edu

**Note:** Completion of the Lawrence Tech requirements in the pre-professional programs does not assure the student of admission to medical, dental, law or graduate school. However, completion of the requirements and of other courses leading to a bachelor's degree does qualify a student for consideration by most professional and graduate schools.

## NATURAL SCIENCES REQUIREMENT:

Certain majors at Lawrence Tech specify Natural Science 1, Natural Science 2, and Natural Science Lab as required courses. To satisfy the Natural Science lecture course requirement, two of the courses listed below must be taken. All prerequisites and corequisites must be satisfied. Well-prepared students may substitute higher-level science courses for those listed below. Students in the University Studies program should consult with their advisor in order to determine which courses best fit their career plans.

Course	Course Name
BIO1213 <sup>1</sup>	Biology 1
BIO1223 <sup>1</sup>	Biology 2
BIO2313	Microbiology
CHM1154	Introduction to Chemical Principles
CHM1213	University Chemistry 1
CHM1223	University Chemistry 2
CHM2313	Organic Chemistry 1
GLG1103	Geology
PHY1154 <sup>2</sup>	Introduction to Physical Principles
PHY1173	Radiation and Environmental Physics
PHY1213	Introductory Astronomy
PHY2213	College Physics 1
PHY2223	College Physics 2
PHY2413	University Physics 1
PHY2423	University Physics 2
PSC1113	Physical Science 1
PSC1123	Physical Science 2

<sup>1</sup>BIO1213 and BIO1223 are independent. Neither is prerequisite to the other.

<sup>2</sup>PHY1154 has a laboratory component that satisfies the requirement for a laboratory course as well as that for a natural science lecture course.

To satisfy the natural science laboratory requirement, *one* of the courses listed below must be taken. All prerequisites and co-requisites must be satisfied.

COURSE	COURSE NAME	CO-REQUISITE	LECTURE
BIO1221	Biology 1 Laboratory	BIO1213	
BIO1231	Biology 2 Laboratory	BIO1223	
CHM1221	University Chemistry 1 Laboratory	CHM1213	
PHY1181	Radiation and Environmental Physics Lab	PHY1173	
PHY1221	Astronomy Laboratory	PHY1213	
PHY2421	University Physics 1	PHY2413	
PHY2431	University Physics 2	PHY2423	
PHY2221	College Physics 1 Laboratory	PHY2213	
PSC1131	Physical Science Laboratory	None	
PHY1154	Introduction to Physical Principles	See note 2	

## ENGLISH AS A SECOND LANGUAGE (ESL)

The purpose of the ESL program is to help students acquire the language skills necessary to do well at Lawrence Tech. The program normally consists of a semester of 18 hours per week of intensive training in conversation, reading, writing, and grammar. A portion of those hours (six or less) may be taken in the actual academic program for which the student has

been conditionally accepted, with appropriate ESL supervision. Permission to pursue this option must be given by the pertinent program in consultation with the ESL program. If at the end of the 18 hours the student has not yet achieved the appropriate level of English, he or she may pursue additional ESL training at the university (a six-hour per week additional semester is the standard).

## MINOR IN BUSINESS MANAGEMENT

MGT1212	Introduction to Business Practices and Issues
SSC2303	Principles of Economics

Five upper division courses in management or human resources. An upper division course in leadership and an upper level class in entrepreneurship must be included as two of the five upper division courses.

## MINOR IN ECONOMICS

MCS1214	Introduction to Mathematical Analysis 1
MCS1224	Introduction to Mathematical Analysis 2
SSC2303	Principles of Economics
OR	
SSC2313	Principles of Macroeconomics
SSC2323	Principles of Microeconomics

Four upper division courses in economics (12 credits)

**Note:** *SSC3523 Money and Banking is an economics course.*

## MINOR IN ENGLISH

World Masterpieces I	LLT1213
World Masterpieces II	LLT1223

Five upper division courses in literature (15 credit hours)

## MINOR IN HISTORY

SSC2413	Foundations of the American Experience
SSC2423	Development of the American Experience

Five upper division courses in history (15 credit hours)



## MINOR IN PHILOSOPHY

COURSE	COURSE NAME
SSC2413	Foundations of American Experience
SSC2423	Development of American Experience

Five upper division courses in philosophy (15 credit hours)  
MCS1203 (Logic) can be taken in place of one of these classes.

**Note:** SSC3723 (*Ethics*) and SSC3733 (*Aesthetics*) are philosophy courses.

## MINOR IN PSYCHOLOGY

PSY1213	Introduction to Psychology
MCS2113	Statistics 1
MCS2123	Statistics 2 OR PSY3113 Research Methods for the Behavioral Scientist

Four upper division courses in psychology (12 credits)

## MINOR IN TECHNICAL AND PROFESSIONAL COMMUNICATION

COM2103	Technical and Professional Communication
COM2113	Speech
COM3473	Document Design OR COM3483 Presentation Media

Five other Technical and Professional Communication electives (15 hours), of which at least three must be upper division.

**CONTACT PERSON:** Dr. James Rodgers, 248.204.3520,  
email: humchair@ltu.edu

## FIVE-YEAR COMBINED B.S. AND MANAGEMENT MASTER'S DEGREES

**Humanities/M.B.A.**

**Humanities/M.S.I.S.**

**Technical and Professional Communication/M.B.A.**

**Technical and Professional Communication/M.S.I.S.**

Humanities and Technical and Professional Communication students may complete the Lawrence Tech M.B.A. or M.S.I.S. pre-core requirements by choosing the appropriate electives. They can then earn the M.B.A. or M.S.I.S. in one additional year after receiving their bachelor's degrees. For more information and a list of suggested course sequences, contact the Humanities, Social Sciences and Communication Department chair, 248.204.3520

## DUAL MAJORS

Chemistry with: Engineering, Physics

Physics with: Engineering, Chemistry

Computer Science with: Engineering, Chemistry

Mathematics with: Engineering

For further information about these dual majors and about minors, please see individual major program descriptions or contact the advisor listed for the major program.

## ASSOCIATE OF SCIENCE IN UNIVERSITY STUDIES

Total Semester Credit Hours: 60

The Associate of Science in university studies is designed for:

- students seeking a high quality two-year liberal arts degree; or
- students who need to demonstrate proficiency at the university level to enter their major of choice.

### FIRST SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
COM1002	Univ Stud Sem	2
COM1103	English Comp	3
MCS1003	Intro to Comp Appl	3
MCSXXX3	Mathematics	3
	Elective	3
		14

### SECOND SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
LLT1213	World Masterpcs 1	3
SSC2413	Found Amer Exper	3
COM2103	Tech & Prof Comm	3
MCS1XX4	Mathematics	4
	Elective	3
		16

### THIRD SEMESTER

LLT1223	World Masterpcs 2	3
SSC2423	Devel Amer Exper	3
	Natural Science 1	3
	Electives	6
		15

### FOURTH SEMESTER

	HSSC Elective	3
	Natural Science 2	3
	Natural Science Lab	1
	Electives	8
		15

While enrolled in the University Studies program, students preparing to enter Lawrence Tech's four-year degree programs will complete courses that fulfill the General Education requirements common to all curricula. In most cases, they will also have the opportunity to complete foundational courses specific to their intended majors, provided that the applicable course prerequisites have been satisfied. Initial course selections will be determined on the basis of students' placement assessment results.

To be eligible to apply for transfer into a four-year major, students must have achieved satisfactory performance in a minimum of 12 credit hours of course work, including specific courses applicable to their programs of choice. Students must see their academic advisors for additional information on course prerequisites, appropriate choices for elective courses, transfer eligibility requirements, and further information specific to their degree programs.

For more information about the University Studies program or to speak with an advisor, contact the College of Arts and Sciences at 248.204.3500, email to scidean@ltu.edu, or visit S101 in the Science Building.

**BACHELOR OF SCIENCE IN BUSINESS MANAGEMENT**  
**Total Semester Credit Hours: 121**

The Bachelor of Science in business management is especially well suited to transfer students or for students with associate degrees, who are often able to complete their bachelor's degree with as few as 60 additional credit hours at Lawrence Tech. Freshman students are also welcomed into the program. The courses shown below are Lawrence Tech courses required for the degree. Courses transferred from other institutions or taken at Lawrence Tech will be evaluated as electives or Lawrence Tech equivalents.

**ARTS AND SCIENCES CORE (49 CREDIT HOURS)**  
**MATHEMATICS/STATISTICS (11 CREDIT HOURS)**

COURSE No.	SUBJECT	Cr. Hrs.
MCS1214	Math Analysis 1	4
MCS1224	Math Analysis 2	4
MCS2113	Statistics 1	3

**SCIENCE (7 CREDIT HOURS)**

Natural Science 1	3
Natural Science 2	3
Natural Science Lab	1

**ENGLISH/COMMUNICATION (10 CREDIT HOURS)**

COM1001	University Seminar	1
COM1103	English Comp	3
COM2103	Tech & Prof Comm	3
COM2113	Speech	3

**HUMANITIES (15 CREDIT HOURS)**

LLT1213	World Masterpieces 1	3
LLT1223	World Masterpieces 2	3
SSC2413	Found Amer Exper	3
SSC2423	Devel Amer Exper	3
LLT/SSC/PSY	Jr/Sr level elective	3

**ECONOMICS (6 CREDIT HOURS)**

SSC2313	Macroeconomics	3
SSC2323	Microeconomics	3

**Management Core (38 CREDIT HOURS)**

MGT1212	Intro. to Business Practices and Issues	2
MGT2203	Management & Supervision	3
MGT2113	Intro Business Law	3
ACC2013	Accounting Principles 1	3
ACC2023	Accounting Principles 2	3
HRM3013	Org Behavior	3
MKT3013	Principles of Marketing	3
FIN3103	Intro Finance Mgt	3
TOM3113	Operations Management	3
MGT4213	Strategic Management	3
INT3023	Information Technology	3
MGT3053, 4053	Internship	6
	Open Electives*	34

**Note:** Electives should include one course each from the Certificate Programs in Entrepreneurship and in Leadership and Change Management. Electives must be taken at the 3000 or 4000 level.

**BACHELOR OF SCIENCE IN HUMANITIES**  
**Total Semester Credit Hours: 121**

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	Cr. Hrs.	COURSE No.	SUBJECT	Cr. Hrs.
COM1001	University Seminar	1		Natural Science 2	3
COM1103	English Comp	3		Natural Science Lab	1
MCS1003	Intro to Comp Appl	3	LLT1213	World Masterpcs 1	3
MSC1214	Intro to Math An 1	4	SSC2413	Found Amer Exper	3
	Natural Science 1	3	MCS1224	Intro to Math An 2	4
			PHY1213	Intro Psychology	3
		14			17

**SOPHOMORE YEAR**

COM2103	Tech & Prof Comm	3	COM2113	Speech	3
LLT1223	World Masterpcs 2	3	SSC2303	Princ Economics	3
SSC2423	Devel Am Exper	3	SSCXXX3	Soc Sci Elective	3
	Open Electives	6		Open Electives	6
		15			15

**JUNIOR YEAR**

LLT3113	Eng Lit to 1800	3	LLT3123	Eng Lit 1800-1914	3
LLT3213	Amer Lit to 1900	3	LLT3223	Amer Lit 1990-Pres	3
SSCXXX3	Soc Sci Elective	3	SSCXXX3	Soc Sci Elective	3
	Open Electives	6		Open Electives	6
		15			15

**SENIOR YEAR**

LLT4113	Early Shakespeare	3	LLT4123	Later Shakespeare	3
LLT4513	Sem In Lit	3	LLTXXX3	Lang/Lit Elective	3
SSCXXX3	Soc Sci Elective	3	SSC4513	Sem in Soc Sci	3
	Open Electives	6	SSCXXX3	Soc Sci Elective	3
		15		Open Electives	3
					15

**Note:** SSC and open electives must be taken at the 3000 or 4000 level.

For more information about the humanities program or to speak with an advisor, contact the Humanities, Social Sciences, and Communication Department at 248.204-3520, email humchair@ltu.edu, or visit room S225 in the Science Building.

For more information about the business management program or to speak with an advisor, contact the Humanities, Social Sciences, and Communication Department at 248.204.3520, email humchair@ltu.edu, or visit room S225 in the Science Building.

**BACHELOR OF SCIENCE IN TECHNICAL AND PROFESSIONAL COMMUNICATION**

Total Semester Credit Hours: 121

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
Course No.	Subject	Cr. Hrs.	Course No.	Subject	Cr. Hrs.
COM1001	University Seminar	1	COM2113	Speech	3
COM1103	English Comp	3	MCS1224	Intro to Math An 2	4
MCSXXX3	Comp Appl	3	PSC1123	Natural Science 2	3
MSC1214	Intro to Math An 1	4	PSC1131	Natural Science Lab	1
	Natural Science 1	3	PHY1213	Intro Psychology	3
		14			14

**SOPHOMORE YEAR**

COM2103	Tech & Prof Comm	3	COM3553	Interpersonal Comm	3
LLT1213	World Masterpcs 1	3	COM3453	Research Prin/Meth	3
SSC2303	Princ of Econ	3	LLT1223	World Masterpcs 2	3
SSC2413	Found Am Exper	3	SSC2423	Devel Am Exper	3
COM2443	Intro Rhet/Logic	3	Open Electives		3
		15			15

**JUNIOR YEAR**

COM3463	Colab Comm	3	COM3103	Adv Prof Comm	3
COM3473	Document Design	3	COM3483	Pres Media	3
COM3543	Tech Editing	3	MCS2123	Statistics 2	3
MCS2113	Statistics 1	3	Open Elective		3
SSCXXX3	Soc Sci Elective	3	Tech Elective		3
	Open Electives	3			
		18			15

**SENIOR YEAR**

COM4113	Internship/Sen Prj	3	SSCXXX3	Soc Sci Elective	3
LLTXXX3	Lang/Lit Elective	3	Open Electives		6
	Comm Electives	6	Tech Elective		6
	Tech Elective	3			
		15			15

**CERTIFICATE IN TECHNICAL AND PROFESSIONAL COMMUNICATION**

The Certificate in Technical and Professional Communication requires the following courses (15 credit hours):

COM2103	Tech & Prof Comm
COM2113	Speech
COM3473	Document Design or COM3483 Presentation Media

6 credits in other COM courses, 2000 level or higher.

**Note:** Electives must be taken at the 3000 or 4000 level.

For more information about the technical and professional communication programs or to speak with an advisor, contact the program director at 248.204.3525, or the Humanities, Social Sciences, and Communication Department at 248.204.3520, email humchair@tu.edu, or visit room S225 in the Science Building.

**BACHELOR OF SCIENCE IN PSYCHOLOGY**  
1. PRE-MED/GRADUATE SCHOOL OPTION

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
Course No.	Subject	Cr. Hrs.	Course No.	Subject	Cr. Hrs.
COM1101	University Seminar	1	PSY1213	Intro to Psychology	3
COM1103	English Comp	3	COM2103	Tech & Prof. Comm	3
MCS1003	Intro to Comp. Appl.	3	BIO1223	Biology 2	3
MCS1414	Calculus 1	4	BIO1231	Biology 2 Laboratory	1
BIO1213	Biology 1	3	MCS1424	Calculus 2	4
BIO1221	Biology 1 Laboratory	1	SSC2413	Found Amer Exp.	3
PSY1001	World of the Mind	1			
		16			17

**SOPHOMORE YEAR**

MCS2113	Statistics 1	3	PSY3113	Res Meth for Beh Sci	3
LLT1223	World Masterpieces 1	3	LLT1213	World Masterpieces 2	3
SSC2423	Devel Am Exp	3	CHM1223	Univ Chem 2	3
CHM1213	Univ Chem 1	3	CHM1232	Univ Chem 2 Lab	2
CHM1221	Univ Chem 1 Lab	1	PHY2423	Coll. Physics 2	3
PHY2413	Coll. Physics 1	3	PHY2431	Coll. Physics 2 Lab	1
PHY2421	Coll. Physics 1 Lab	1			
		17			15

**JUNIOR YEAR**

PSY3413	Sen & Percept	3	PSY3213	Cognitive Psy	3
PSY3421	Sen & Percept Lab	1	PSY3221	Cognitive Psy Lab	1
CHM2313	Org Chem 1	3	CHM2323	Org Chem 2	3
	Physiology	3	CHM2332	Org Chem 2 Lab	2
	Physiology Laboratory 1	1	PSY Elective (Rec.:		
PSY3623	Social Psychology	3	PSY3613	Dev Psych)	3
BIO2323	Moleculer Genetics	3	LLT/SSC	Jr/Sr Elective	3
		17			15

**SENIOR YEAR**

PSY4213	Behav Neurosci	3	PSY Electives		6
PSY4221	Behav Neurosci Lab	1	SSC3313	Hist & Phil of Science or	
				(Phil of Mind)	3
PSY3633	Abnormal Psychology	3	CHM3403	Biochemistry** or	
	Open Electives	5		Jr/Sr Bio Elective	3
		12			12

**TOTAL CREDITS:** 121

**Note:** Electives must be taken at the 3000 or 4000 level.

\*\*Highly recommended for Pre-Med

**GENERAL PSYCHOLOGY OPTION\*\*\***

\*\*\* Acceptable for Graduate School in Clinical Psychology

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1101	University Seminar	1	BIO1223	Biology 2	3
COM1103	English Comp	3	BIO1231	Biology 2 Laboratory	1
MCS1003	Intro to Comp. Appl.	3	MCS1224	Intro to Math An. 2	4
MCS1214	Intro to Math An. 1	4	COM2103	Tech & Prof. Comm	3
BIO1213	Biology 1	3	PSY1213	Intro to Psychology	3
BIO1221	Biology 1 Laboratory	1			
PSY1001	World of the Mind	1			
		16			14

**SOPHOMORE YEAR**

MCS2113	Statistics 1	3	PSY3113	Res Meth for Beh Sci	3
SSC2413	Found Amer Exp	3	LLT1213	World Masterpcs 2	3
COM2113	Speech	3	SSC2423	Devel Am Exp	3
LLT1223	World Masterpieces 1	3	PSY3623	Social Psychology	3
	Open Electives	6		Open Elective	3
		18			15

**JUNIOR YEAR**

PSY3413	Sens & Perception	3	PSY3213	Cognitive Psy	3
PSY3421	Sens & Percept Lab	1	PSY3221	Cognitive Psy Lab	1
	PSY Elective		PSY4633	Clinical Psychology	3
	(Rec.: Abn Psych)	3	PSY3613	PSY Elective (Rec.: Dev Psych)	3
	Physiology	3		Open Electives	6
	Physiology Lab	1			
	Open Electives	6			
		17			16

**SENIOR YEAR**

PSY4213	Behav Neurosci	3		Open Electives	6
PSY4221	Behav Neurosci Lab	1		PSY Elective	3
	PSY Elective	3	SSC3313	Hist & Phil of Science	
	LLT/SSC Jr/Sr Elective	3	Or	Science	
	Open Elective	3	SSC3713	or (Phil of Mind)	3
		13			12

**TOTAL CREDITS 121**

**Note:** Electives must be taken at the 3000 or 4000 level.

For more information about the psychology program or to speak with an advisor, contact the department at 248.204.3520, email to humchair@ltu.edu, or visit S225 in the Science Building.

**3. INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY OPTION**

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1101	University Seminar	1	BIO1223	Biology 2	3
COM1103	English Comp	3	BIO1231	Biology 2 Laboratory	1
MCS1003	Intro to Comp. Appl.	3	MCS1224	Intro to Math An. 2	4
MCS1214	Intro to Math An. 1	4	COM2103	Tech & Prof. Comm	3
BIO1213	Biology 1	3	PSY1213	Intro to Psychology	3
BIO1221	Biology 1 Laboratory	1			
PSY1001	World of the Mind	1			
		16			14

**SOPHOMORE YEAR**

MCS2113	Statistics 1	3	PSY3113	Res Meth for Beh Sci	3
SSC2413	Found Amer Exp	3	LLT1213	World Masterpcs 2	3
COM2113	Speech	3	SSC2423	Devel Am Exp	3
LLT1223	World Masterpieces 1	3	PSY3623	Social Psychology	3
	Open Elective	3		Open Elective	3
		15			15

**JUNIOR YEAR**

PSY3313	Industrial Psychology	3	PSY3213	Cognitive Psy	3
HRM3023	Personnel/HR Mgt.	3	PSY3221	Cognitive Psy Lab	1
PSY4633	Clinical Psychology	3	PSY3323	Organizational Psy	3
	Open Elective	6	PSY3613	Developmental Psy	3
			LLT/SSC3 Jr/Sr Elective		3
			Open Electives		3
		15			16

**SENIOR YEAR**

HRM4013	Employee-Mgt. Rel	3	HRM4033	HR Problems & Pol	3
PSY4213	Behavi Neuroscience	3	SSC3313	Hist & Phil of Science	
	PSY Electives	6	or		
	Open Elective	3	SSC3713	(Phil of Mind)	3
			Open Electives		9
		15			15

**TOTAL CREDITS 121**

**MAJOR ELECTIVES:**

- PSY3613 Developmental Psychology
- PSY3633 Abnormal Psychology
- PSY4633 Clinical Psychology
- PSY3323 Organizational Psychology
- PSY4313 Drugs and Behavior
- PSY4513 Animal Behavior
- PSY4413 History and Systems of Psychology

**Note:** Electives must be taken at the 3000 or 4000 level.



## CERTIFICATE IN INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY

Two of the following three courses:

- HRM3023 Personnel/Human Resources Management
- HRM4013 Employee-Management Relations
- HRM4033 Human Relations Problems and Policies

And the following:

- PSY3213 Cognitive Psychology
- PSY3221 Cognitive Psychology Lab
- PSY3313 Industrial Psychology
- PSY3323 Organizational Psychology

**RECOMMENDED GENERAL ELECTIVES:** Courses towards Certificate in Ind/Org Psychology, or else biology or computer science courses.

## BACHELOR OF SCIENCE IN COMPUTER SCIENCE - OPTION 1

Total Semester Credit Hours: 122

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	SSCXXX3	Elective	3
COM1103	English Comp	3	LLT1213	World Masterpcs 1	3
MCS1142	Intro to C	2	MCS1424	Calculus 2	4
MCS1414	Calculus 1	4	MCS1514	Computer Sci 1	4
SSC2413	Found Am Exper	3	SSC2423	Devel Am Exper	3
		13			17

### SOPHOMORE YEAR

LLT1223	World Masterpcs 2	3	COM2103	Tech & Prof Comm	3
MCS2414	Calculus 3	4	MCS2534	Data Structures	4
MCS2514	Computer Sci 2	4	MCS3633	Functional Prog	3
MCS2523	Discrete Math	3	MCSXXX3	CS Elective	3
		14			16

### JUNIOR YEAR

MCS3543	Data Base Sys	3	MCSXXX3	CS Elective	3
MCS3663	Arch & Assembler	3	MCS4663	Operating Syst	3
MCSXXX3	Math Elective*	3	PHY2423	Univ Physics 2	3
PHY2413	Univ Physics 1	3	PHY2431	Univ Phys 2 Lab	1
PHY2421	Univ Phys 1 Lab	1	Open Electives		6
MCSXXX3	CS Elective	3			16
		16			16

### SENIOR YEAR

MCS4613	Comp Networks	3	LLTXXX3	Jr/Sr Elective	3
MCS4833	Senior Project	3	MCS4643	Comp Prog Lang	3
SSCXXX3	Jr/Sr Elective	3	MCS4653	Theory/Computation	3
Open Electives		6	Open Electives		6
		15			15

\*Note: Students must take either MCS2423 Diff Equations or MCS3403 Prob & Stat or MCS3863 Linear Algebra

## COMPUTER SCIENCE MINOR:

Students must take 24 credits of computer science courses.

## DUAL MAJOR IN COMPUTER SCIENCE:

Students can earn a dual major in computer science and another discipline by completing the degree requirements of both programs.

For more information about the computer science program or to speak with an advisor, contact the Mathematics and Computer Science Department at 248.204.3560, email mcschair@ltu.edu, or visit room S120 in the Science Building.

## BACHELOR OF SCIENCE IN COMPUTER SCIENCE - OPTION 2

Total Semester Credit Hours: 121

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2423	Devel Am Exper	3
MCS1524	Intro Discrete Math	4	MCS1224	Intro Math Anal 2	4
MCS1142	Intro to C	2	MCS1514	Computer Sci 1	4
MCS1214	Intro Math Anal 1	4			
SSC2413	Found Am Exper	3			
		17			14

### SOPHOMORE YEAR

	Natural Science 1	3	COM2103	Tech & Prof Comm	3
LLT1223	World Masterpcs 2	3	MCS2534	Data Structures	4
MCS2514	Computer Sci 2	4	MCS3633	Functional Prog	3
MCS2523	Discrete Math	3		Natural Sci 2	3
SSCXXX3	Elective	3		Natural Sci Lab	1
		16			14

### JUNIOR YEAR

MCS2113	Statistics 1	3	MCS2123	Statistics 2	3
MSC3543	Data Base Sys	3	MCSXXX3	CS Elective	3
MCS3663	Arch & Assembler	3	MCS4663	Operating Syst	3
MCSXXX3	CS Elective	6	Open Electives		6
		15			15

### SENIOR YEAR

MCS4613	Comp Networks	3	LLTXXX3	Jr/Sr Elective	3
MCS4833	Senior Project	3	MCS4643	Comp Prog Lang	3
SSCXXX3	Jr/Sr Elective	3	MCS4653	Theory/Computation	3
Open Electives		6	Open Electives		6
		15			15

## CERTIFICATE IN COMPUTER SCIENCE:

The certificate in Computer Science requires the following courses:

MCS1514 MCS3663 MCS4653  
 MCS2514 MCS4613 MCS4663  
 MCS2534

For more information about the computer science program or to speak with an advisor, contact the Mathematics and Computer Science Department at 248.204.3560, email [mcschair@itu.edu](mailto:mcschair@itu.edu), or visit room S120 in the Science Building.

## BACHELOR OF SCIENCE IN COMPUTER SCIENCE - OPTION 3

Total Semester Credit Hours: 121

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2413	Found Am Exper	3
MCS1142	Intro to C	2	MCS1224	Intro Math Anal 2	4
MCS1214	Intro Math Anal 1	4	MCS1514	Computer Sci 1	4
MCS1524	Intro Discrete Math	4	MCS1623	Visual Basic	3
		14			17

### SOPHOMORE YEAR

	Natural Science 1	3	COM2103	Tech & Prof Comm	3
LLT1223	World Masterpcs 2	3	MCS2534	Data Structures	4
MCS2514	Computer Sci 2	4	MCS3673	Network Admin	3
MCS2523	Discrete Math	3		Natural Sci 2	3
SSC2423	Devel Am Exper	3		Natural Sci Lab	1
		16			14

### JUNIOR YEAR

MCS2113	Statistics 1	3	MCS2123	Statistics 2	3
MCS3543	Data Base Sys	3	INT3103	Tech Man	3
MCS3663	Arch & Assembler	3	MCS4663	Operating Syst	3
MCSXXX3	CS Elective	3		Open Electives	6
SSCXXX3	Elective	3			
		15			15

### SENIOR YEAR

MCS4613	Comp Networks	3	LLTXXX3	Jr/Sr Elective	3
MCS4833	Senior Project	3	INT4203	Sys Analysis	3
SSCXXX3	Jr/Sr Elective	3	MCSXXX3	CS Elective	3
	Open Electives	6		Open Electives	6
		15			15

For more information about the computer science program or to speak with an advisor, contact the Mathematics and Computer Science Department at 248.204.3560, email [mcschair@itu.edu](mailto:mcschair@itu.edu), or visit room S120 in the Science Building.

## BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

Total Semester Credit Hours: 120

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSCXXX3	Elective	3
CHM1213	University Chem 1	3	MCS1424	Calculus 2	4
CHM1221	Univ Chem 1 Lab	1	MCS1514	Computer Sci 1	4
MCS1142	Intro to C	2	SSC2423	Devel Am Exper	3
MCS1414	Calculus 1	4			
SSC2413	Found Am Exper	3			
		17			17

### SOPHOMORE YEAR

MCS2414	Calculus 3	4	LLT1223	World Masterpcs 2	3
MCS2514	Computer Sci 2	4	MCS2423	Diff Equations	3
MCS2523	Discrete Math	3	MCS2534	Data Structures	4
PHY2413	Univ Physics 1	3	COM2103	Tech & Prof Comm	3
PHY2421	Univ Phys 1 Lab	1	PHY2423	Univ Physics 2	3
			PHY2431	Univ Phys 2 Lab	1
		15			17

### JUNIOR YEAR

SSCXXX3	Jr/Sr Elective	3	MCS4663	Operating Systems	3
MCS3663	Arch & Assembler	3	MCS3403	Prob and Stat	3
MCS3723	Advanced Calculus	3	MCS3523	Math Modeling	3
MCS3543	Data Base Sys	3	MCS3743	Complex Analysis	3
MCS3863	Linear Algebra	3		Open Elective	3
		15			15

### SENIOR YEAR

MCS4833	Senior Proj	3	LLTXXX3	Jr/Sr Elective	3
MCS3733	Part Diff Equat	3	MCS4653	Theory/Computation	3
MCS4813	Num Anal 1	3	MCS4863	Modern Algebra	3
MCS4613	Comp Networks	3		Open Elective	3
		12			12

For more information about the mathematics and computer science program or to speak with an advisor, contact the Mathematics and Computer Science Department at 248.204.3560, email [mcschair@itu.edu](mailto:mcschair@itu.edu), or visit room S120 in the Science Building.

## BACHELOR OF SCIENCE IN MATHEMATICS

Total Semester Credit Hours: 121

### FRESHMAN YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Sem	1
COM1103	English Comp	3
CHM1213	Univ Chemistry 1	3
CHM1221	Univ Chem 1 Lab	1
MCS1142	Intro to C	2
MCS1414	Calculus 1	4
SSC2413	Found Amer Exper	3
		17

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
CHM1223	Univ Chemistry 2	3
SSCXXX3	Elective	3
MCS1424	Calculus 2	4
MCS1514	Computer Sci 1	4
SSC2423	Devel Am Exper	3
		17

### SOPHOMORE YEAR

LLT1213	World Masterpcs 1	3	COM2103	Tech & Prof Comm	3
MCS2414	Calculus 3	4	LLT1223	World Masterpcs 2	3
MCS2523	Discrete Math	3	MCS2423	Diff Equations	3
PHY2413	Univ Physics 1	3	PHY2423	Univ Physics 2	3
PHY2421	Univ Phys 1 Lab	1	PHY2431	Univ Phys 2 Lab	1
		14			13

### JUNIOR YEAR

MCS3723	Advanced Calculus	3	MCS3403	Prob and Stats	3
MCS3543	Data Base Sys	3	MCS3523	Math Modelling	3
MCS3863	Linear Algebra	3	MCS3743	Complex Analysis	3
SSCXXX3	Jr/Sr Elective	3		Open Electives	6
	Open Elective	3			15
		15			15

### SENIOR YEAR

MCS3733	Part Diff Equat	3	LLTXXX3	Jr/Sr Elective	3
MCS4813	Numerical Anal 1	3	MCS4863	Modern Algebra	3
MCSXXX3	Jr/Sr Math Elective	3	MCS4833	Senior Project	3
	Open Electives	6		Open Electives	6
		15			15

### MATHEMATICS MINOR:

Students must take 29 credit hours of mathematics courses. Engineering students need only 9 additional credit hours because the engineering curriculum already requires 20 credit hours of mathematics.

### DUAL MAJOR IN MATHEMATICS:

Students can earn a dual major in mathematics and another discipline by completing the degree requirements of both programs.

For more information about the mathematics program or to speak with an advisor, contact the Mathematics and Computer Science Department at 248.204.3560, email [mcschair@ltu.edu](mailto:mcschair@ltu.edu), or visit room S120 in the Science Building.

## BACHELOR OF SCIENCE IN CHEMISTRY

with Biomedical, Engineering Chemistry & ACS-certified options

Total Semester Credit Hours: 121-127

## BACHELOR OF SCIENCE IN ENVIRONMENTAL CHEMISTRY

Total Semester Credit Hours: 120

### FRESHMAN YEAR (ALL CHEMISTRY PROGRAMS)

#### FIRST SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1
COM1103	English Comp	3
CHM1213	University Chem 1	3
CHM1221	Univ Chem 1 Lab	1
MCS1414	Calculus 1	4
SSC2413	Found Am Exper	3
		15

#### SECOND SEMESTER

COURSE No.	SUBJECT	CR. Hrs.
CHM1233	University Chem 2	3
CHM1232	Univ Chem 2 Lab	2
LLT1213	World Masterpcs 1	3
MCS1424	Calculus 2	4
SSC2423	Devel Am Exper	3
		15

### SOPHOMORE YEAR (EXCEPT ENGINEERING CHEMISTRY)

CHM2313	Organic Chem 1	3	CHM2323	Organic Chem 2	3
CHM2342	Analytical Chem	2	CHM2332	Organic Chem Lab	2
CHM2352	Analytical Lab	2	LLT1223	World Masterpcs 2	3
PHY2413	Univ Physics 1	3	MCSXXX3	Advanced Math	3
PHY2421	Univ Physics 1 Lab	1	PHY2423	University Phys 2	3
MCS2414	Calculus 3	4	PHY2421	Univ Phys 2 Lab	1
		15			15

### SOPHOMORE YEAR (ENGINEERING CHEMISTRY)

CHM2313	Organic Chem 1	3	CHM2323	Organic Chem 2	3
EGE1X01	Engr Comp App (x2)	2	CHM2332	Organic Chem Lab	2
LLT1223	World Masterpcs 2	3	EGE1023	Intro to Materials	3
PHY2413	Univ Physics 1	3	MTH2423	Differential Equat	3
PHY2421	Univ Physics 1 Lab	1	PHY2423	University Phys 2	3
MCS2414	Calculus 3	4	PHY2421	Univ Phys 2 Lab	1
		17			15

For more information about the chemistry programs or to speak with an advisor, contact the Natural Sciences Department at 248.204.3600, email [ncschair@ltu.edu](mailto:ncschair@ltu.edu), or visit room S332 in the Science Building.



**CURRICULUM SUMMARY IN CHEMICAL SCIENCES**
**Bachelor of Science in Chemical Biology (121 credits)**

This interdisciplinary major includes biology courses as well as solid fundamental training in chemistry. It automatically satisfies the criteria for admission to all medical schools and prepares the graduate for employment in the pharmaceutical or biotechnology industry or for graduate work in chemistry, biochemistry or molecular biology. See pg. 88 for a complete curriculum summary.

**Bachelor of Science in Chemistry**

There are two curriculum options available for the Bachelor of Science in chemistry

*Option 1: ACS-Certified (123 credits)*

This program is certified by the American Chemical Society and provides the most thorough training for a career in any of the many chemistry sub-disciplines. It enables the graduate to seek immediate employment in the chemical industry and gives each student the firm background required to pursue a graduate degree in chemistry or biochemistry. With a suitable choice of electives and additional courses, it offers a sound background for medical school or other health professions. This option requires 53 credits in chemistry. See pg. 88 for a complete curriculum summary.

*Option 2: Engineering Chemistry (126 credits)*

This demanding option incorporates a broad range of engineering courses into the chemistry curriculum. A student choosing this option would be well positioned for the majority of jobs in both chemistry and chemical engineering. The engineering chemistry option also provides excellent preparation for graduate work in chemistry, chemical engineering or materials science. Students choosing a double major or dual degree in chemistry and engineering will find this curriculum convenient, since many courses apply to both programs. This option requires a minimum of 31 credits in chemistry and a minimum of 30 credits in engineering. See pg. 88 for a complete curriculum summary.

**Bachelor of Science in Environmental Chemistry (121 credits)**

This program focuses training in chemistry on problems and technology involving the environment. The curriculum has been recently revised to include more field training and a senior project. It requires 55 credits in chemistry and also includes training in biology and geology. See pg. 88 for a complete curriculum summary.

**JUNIOR/SENIOR REQUIREMENTS**
**Required for all programs (20 credits):**

COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
CHM3423	Physical Chem 1	3	CHM3421	Phys Chem Lab 1	1
CHM3452	Intermed Inorganic	2	MCS1142	Introduction to C1	2
COM2103	Tech & Prof Comm	3	SSC/PSYXXX3	Elective	3
LLT3XX3	Jr/Sr Elective	3	SSC/PSY3XX3	Jr/Sr Elective	3

**Required for B.S. in Chemical Biology (40 credits):**

BIO2323	Molecular Genetics	3	BIO3113	Cell Biology	3
BIO3121	Cell Biology Lab	1	BIO4113	Physiology	3
CHM2342	Analytical Chemistry	2	CHM2352	Analytical Lab	2
CHM2631	Instrumental Lab	1	CHM3403	Biochemistry	3
CHM3411	Biochemistry Lab	1	CHM4403	Adv Biochemistry	3
CHM4723	Advanced Organic	3	CHM/BIO	Chem/Bio Electives	2 6
MTHxxxx	Adv Math	3		Open Electives	6

**Required for B.S. in Chemistry, ACS Certified (43 credits):**

CHM3403	Biochemistry	3	CHM3434	Physical Chem 2	4
CHM3431	Phys Chem Lab 2	1	CHM3463	Adv Synth Lab	3
CHM4522	Adv Spectroscopy	2	CHM4542	Physical-Anal Lab 2	2
CHM4632	Instr Anal Lab	2	CHM4643	Adv Inorg Chem	3
CHM4723	Advanced Organic	3	CHMXXX	Chemistry Electives	3
	Open Electives	17			

**Required for B.S. in Chemistry, Engineering Chemistry (46 credits):**

CHM3434	Physical Chem 2	4	CHM3431	Phys Chem Lab 2	1
CHMxxxx	Chemistry Elect 2	9	EGE2013	Statics	3
EEE2123	Circuits	3	EME2011	Eng Materials Lab	1
EME3013	Mechanics of Mat	3	EME3043	Dynamics	3
EME3024	Fluid Mechanics	4	EME4013	Heat Transfer	3
EME4213	Advanced Materials	3	Exxxxxxx	Eng Electives	6
	Open Electives	3			

**Required for B.S. in Environmental Chemistry (41 credits):**

BIO1223	Biology 2	3	BIO1231	Biology 2 Lab	1
CHM3383	Environ Chemistry 1	3	CHM3392	Envir Sampling Meth	2
CHM3403	Biochemistry	3	CHM3434	Physical Chem 2	4
CHM3431	Phys Chem Lab 2	1	CHM3463	Adv Synthesis Lab	3
CHM3592	Environ Chemistry 2	2	CHM4522	Adv Spectroscopy	2
CHM4542	Physical-Anal Lab 2	2	CHM4632	Instr Anal Lab	2
CHM4912	Senior Project 1	2	CHM4922	Senior Project 2	2
GLG1103	Geology	3		Open Electives	6

**Notes and Options:**

1. Certain other programming courses can be substituted with permission of the chair.
2. Students must elect at least three credit hours of advanced laboratory work in courses numbered CHM3000 or higher.

**CHEMISTRY MINOR: (Minimum of 20 hours)**

Students must take a minimum of 20 credit hours in chemistry. Engineering students need 16 credit hours in addition to the required 4 credit hours of chemistry. Computer science students can complete a minor by choosing chemistry courses for the open elective courses in their curriculum. No additional credits are necessary.

**Required Courses: (9 credit hours)**

CHM1213	University Chemistry 1	CHM1223	University Chem 2
CHM1221	University Chem 1 Lab	CHM1232	University Chem 2 Lab



**Chemistry Electives: (Minimum of 11 credit hours)**

Selected from the following courses. All prerequisites and co-requisites must be followed.

CHM2342 Analytical Chemistry	CHM3463 Adv Synthesis Lab
CHM2352 Analytical ChemLab	CHM3503 Comp Appl in Chem
CHM3383 EnvironChemistry	CHM3623 Intro to Poly Chem
CHM3403 Biochemistry	CHM3723 Adv Organic Chem
CHM3423 Physical Chemistry 1	CHM4522 Adv Spectroscopy
CHM3434 Physical Chemistry 2	CHM4542 Physical-Anal Lab 2
CHM3442 Physical-Anal Lab 1	CHM4632 Instrumental Anal Lab
CHM3452 Inter Inorganic Chem	CHM4643 Adv Inorg Chemistry

**CHEMISTRY AND ENGINEERING DUAL MAJOR**

Students who take 36 additional chemistry credit hours can obtain a dual degree in chemistry and engineering. See the chemistry advisor for required and elective courses.

**CHEMISTRY AND PHYSICS DUAL MAJOR**

Students who take all of the required chemistry and physics courses in both majors can obtain a dual bachelor's degree in chemistry and physics. 30 additional credit hours are required beyond the first degree.

**CHEMISTRY AND COMPUTER SCIENCE DUAL MAJOR**

Students who take 30 additional chemistry credit hours can obtain a dual bachelor's degree in chemistry and computer science. See the chemistry advisor for required and elective courses.

**ASSOCIATE OF SCIENCE IN CHEMICAL TECHNOLOGY**

Total Semester Credit Hours: 61

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Sem	1	CHM1223	University Chem 2	3
COM1103	English Comp	3	CHM1232	Univ Chem 2 Lab	2
CHM1213	University Chem 1	3	LLT1213	World Masterpcs 1	3
CHM1221	Univ Chem 1 Lab	1	MCS1224	Intro Math Anal 2*	4
MCS1003	Intro Comp Appl	3	SSC2413	Found Amer Exp	3
MCS1214	Intro Math Anal 1*	4			
		15			15
THIRD SEMESTER			FOURTH SEMESTER		
CHM2313	Organic Chem 1	3	CHM2323	Organic Chem 2	3
CHM2342	Analytical Chem	2	CHM2332	Organic Chem Lab	2
CHM2352	Analy Chem Lab	2	CHM2631	Instrumental Lab	1
MCS1142	Intro to C	2	LLT1223	World Mast 2	3
MCS2023	Statistical Meth*	3	PHY1154	Intro Phys Princ	4
SSC2423	Devel Amer Exp	3		Hum Elective	3
		15			16

\*Students wishing to continue on to the Bachelor of Science in chemistry may follow the mathematics sequence for that degree.

For more information about the chemistry and chemical technology programs or to speak with an advisor, contact the Natural Sciences Department at 248.204.3600, email ncschair@ltu.edu, or visit room S322 in the Science Building.

**BACHELOR OF SCIENCE IN PHYSICS**

with Professional, Biophysics, Chemical Physics and Applied Physics Options

Total Semester Credit Hours: 123(minimum)

**BACHELOR OF SCIENCE IN PHYSICS & COMPUTER SCIENCE**

Total Semester Credit Hours: 127

**FRESHMAN YEAR (ALL PHYSICS PROGRAMS)**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1		Chem or Eng <sup>1</sup>	5
COM1103	English Comp	3	PHY1213	Astronomy	3
CHM1213	University Chem 1	3	PHY1221	Astronomy Lab	1
CHM1221	Univ Chem 1 Lab	1	MCS1424	Calculus 2	4
MCS1414	Calculus 1	4	SSC2423	Devel Am Exper	3
SSC2413	Found Am Exp	3			
PSC1161	Physical Sci Sem	1			
		16			16

**SOPHOMORE YEAR (VARIABLE)**

PHY2413	University Phys 1	3	PHY2423	University Phys 2	3
PHY2421	Univ Phys 1 Lab	1	PHY2421	Univ Phys 2 Lab	1
MCS2414	Calculus 3	4	MCSXXX3	Advanced Math <sup>3</sup>	3
MCSXXX3	Statistics Course <sup>2</sup>	3	MCS1514	Computer Sci <sup>14</sup>	4
MCS1142	Introduction to C	2	MCS2423	Differential Eqns	3
LLT1213	World Masterpcs 1	3	LLT1223	World Masterpcs 2	3
		16			13-17

**Notes and Options:**

1. Either EGE1012, Intro to Engineering, plus EGE1101/1201/1301, Eng Comp App. (Option 4) or CHM1223, University Chemistry 2, and CHM1232, University Chemistry 2 Laboratory (all other programs).
2. Either MCS2113, Statistics 1 Option 2), or MCS3403, Prob and Stat (all other programs).
3. Either MCS2123, Statistics 2 (Option 2), or MCS3863, Linear Algebra (all other programs).
4. MCS1514 is required only for the Physics & Computer Science major. Students in the Physics major will often select an additional course from those listed in the Junior/Senior curriculum.

For more information about the physics programs or to speak with an advisor, contact the Natural Sciences Department at 248.204.3600, email ncschair@ltu.edu, or visit room S322 in the Science Building.

## BACHELOR OF SCIENCE IN PHYSICS

### Option 1: Professional Physics (123 credits)

This program gives the broad training required to pursue a professional career in any area of physics. It provides for the most fundamental training in all physics sub-disciplines, including acoustics, geophysics, lasers, holography, optical science and industrial and academic research. With a suitable choice of electives a student can devise a personal curriculum that allows for a wide choice of future careers or for a broad liberal arts experience. Heavy emphasis is given to laboratory work and computer skills. Details of this program are given in the accompanying chart.

Humanities Core:	28 credits
Physics/Physical Science:	47 credits
Chemistry:	9 credits
Mathematics/CS:	26 credits
General Electives:	13 credits

### Option 2: Biophysics (123 credits)

This version of the major includes biology courses as well as a fundamental background in physics. It automatically satisfies the criteria for admission to all medical schools and provides the proper background for professional work in medical imaging, the biotechnology industry or for graduate work in physics, biophysics or bioengineering. Model plans of work may be obtained from the chair of Natural Sciences.

Humanities Core:	28 credits
Physics/Physical Science:	36 credits
Chemistry:	19 credits
Biology:	11 credits
Mathematics/CS:	23 credits
General Electives:	6 credits

### Option 3: Chemical Physics (125 credits)

This option combines training in physics with extensive training in chemistry. It gives the graduate a unique combination of skills for employment in a wide variety of industries. A student choosing this option can readily pursue graduate work in physics, chemistry or materials science. Model plans of work may be obtained from the chair of Natural Sciences.

Humanities Core:	28 credits
Physics/Physical Science:	47 credits
Chemistry:	21 credits
Mathematics/CS:	26 credits
General Electives:	3 credits

### Option 4: Applied Physics (127 credits)

This program combines training in physics with extensive training in engineering. This course of study will appeal to the student who wants a deep understanding of the fundamentals along with practical applications of technology. All students choosing this option take a common engineering core, then pursue a coherent advanced engineering and physics curriculum. A student choosing this option would be well positioned for a wide spectrum of jobs in both physics and engineering and would be prepared to pursue graduate work in physics,

mechanical engineering, electrical engineering or materials science. With a suitable selection of technical electives this option can prepare a student for graduate work in bioengineering. Model plans of work may be obtained from the chair of Natural Sciences.

Humanities Core:	28 credits
Physics/Physical Science:	39 credits
Chemistry:	4 credits
Mathematics/CS:	26 credits
Engineering:	14 credits
Technical Electives:	16 credits

## JUNIOR/SENIOR COURSES

### Required for All Programs (28 credits):

Course No:	Subject	Cr. Hrs.
PHY3574	Electricity & Mag	4
PHY3661	Contemp Phys Lab	1
PHY4912	Physics Project 1	2
COM2103	Tech & Prof Comm	3
LLT3XX3	Jr/Sr Elective	3
PHY3653	Contemporary Phys	3
PHY4724	Quantum Physics	4
PHY4922	Physics Project 2	2
SSC/PSYXXX3	Elective	3
SSC/PSY3XX3	Jr/Sr Elective	3

### Required for BS in Physics, Option 1 (34 credits):

PHY3414	Analytical Mech	4
PHY4763	Thermal Physics	3
PHY3613	Circuits & Elec	3
PHY4743	Opt Lasers & Micr	3
PHY4781	Opt Las Micr Lab	1
	Open Electives	13
PHY4843	Cond Matter Phys	3
PHY3611	Circuits & Elec Lab	1
MCS3723 or	Adv Calculus	
MCS3413	Adv Eng Math	3

### Required for BS in Physics, Option 2 (34 credits):

PHY4743	Optics Lasers & Micr	3
PHY4763	Thermal Physics	3
CHM2313	Organic Chem 1	3
CHM2352	Analyt Chem Lab	2
BIO1213	Biology 1	3
BIO1223	Biology 2	3
BIOXXX3	Biology Elective	3
PHY4781	Opt Las Micr Lab	1
CHM2342	Analytical Chem	2
CHMXXX3	Chemistry Elective	3
BIO1221	Biology 1 Lab	1
BIO1231	Biology 2 Lab	1
	Open Electives	6

## Required for BS in Physics, Option 3 (36 credits):

Course No:	Subject	Cr. Hrs.
PHY3613	Circuits & Elec	3
PHY3611	Circuits & Elec Lab	1
PHY4843	Cond Matter Phys	3
PHY4743	Optics Lasers & Micr	3
PHY4763	Thermal Physics	3
CHMXXXX	Chem Electives	12
	Open Electives	3
PHY3414	Analytical Mech	4
PHY4781	Opt Las Micr Lab	1
MCS3723 or	Adv Calculus	
MCS3413	Adv Eng Math	3

## Required for BS in Physics, Option 4 (38 credits):

PHY4763	Thermal Physics	3
PHY3613	Circuits & Elec	4
EGE1023	Intro to Materials	3
EME3043	Dynamics	3
PHY4843	Cond Matter Phys	3
PHY3611	Circuits & Elec Lab	1
MCS3723 or	Adv Calculus	
MCS3413	Adv Eng Math	3
EGE2013	Statics	3
	Technical Elec	16

## Required for BS in Physics and Computer Science (34 credits):

PHY3414	Analytical Mech	4
PHY4763	Thermal Physics	3
PHY4843	Cond Matter Phys	3
PHY4743	Optics Lasers & Micr	3
PHY4781	Optics Lasers & Micr Lab	3
MCS2514	Computer Science 2	4
MCS3XX3	Math/CS Electives	6
MCS3723	Adv Calculus	3
MCS2534	Data Structures	4
MCS4813	Numerical Anal 1	3

## PHYSICS Minor: (Minimum of 20 credit hours)

### Required Courses: (12 credit hours)

PHY2413	University Physics 1	PHY2431	University Phys 2 Lab
PHY2421	University Phys 1 Lab	PHY3653	Contemporary Phys
PHY2423	University Physics 2	PHY3661	Contemp Phys Lab

### Physics Minor Electives: (Minimum of 8 credit hours)

Selected from the following courses. All prerequisites and co-requisites must be followed.

PHY1173	Radiation & Env Phys	PHY4724	Quantum Mechanics
PHY1181	Radiation & Env Phys Lab	PHY4743	Opt, Lasers & Micro
PHY3513	Theoretical Mechanics 1	PHY4781	Opt, Lasers & Mic Lab
PHY3523	Theoretical Mechanics 2	PHY4843	Cond Matter Phys
PHY4991	Directed Study in Phys		

## GENERAL SCIENCES Minor: (25 credit hours)

The following courses are required for a General Sciences minor.

BIO1213	Biology 1	BIO1223	Biology 2
BIO1221	Biology 1 Lab	BIO1231	Biology 2 Lab
CHM1213	University Chemistry 1	CHM1223	University Chem 2
CHM1221	Univ Chemistry 1 Lab	CHM1232	Univ Chemistry 2 Lab

One of the following Physics sequences is required for the General Sciences minor.

PHY2413	University Physics 1	PHY2423	University Physics 2
PHY2421	Univ Physics 1 Lab	PHY2431	Univ Physics 2 Lab
OR			
PHY2213	College Physics 1	PHY2223	College Physics 2
PHY2221	College Physics 1 Lab	PHY2231	College Physics 2 Lab

All prerequisites and co-requisites must be satisfied for these required courses. Those who wish to receive a certificate for this minor must apply to the Department of Natural Sciences, in room S322.

## PHYSICS AND ENGINEERING DUAL MAJORS

Students who take 36 additional physics credit hours can obtain a dual degree in physics and mechanical engineering. Students who take an additional 32 physics credit hours may obtain a dual degree in physics and electrical engineering. Please see the physics advisor for required and elective courses.

## PHYSICS AND CHEMISTRY DUAL MAJORS

Students must take all of the required chemistry and physics courses in both majors. If the student completes the physics major first, 30 additional chemistry credit hours are required. If chemistry is completed first, 23 additional physics credit hours are required. These additional hours apply only if appropriate electives are chosen.



**DEPARTMENT OF HUMANITIES, SOCIAL SCIENCES AND COMMUNICATION**

**Professors:**  
James S. Rodgers  
Gonzalo Munevar  
Flumo Y. Stevens

**Associate Professors:**  
Harold Hotelling  
Barry W. Knister  
Douglass V. Koch, emeritus  
Marvin Stern  
Philip K. Vogt

**Assistant Professors:**  
Betty Stover (chair)  
Melinda Weinstein  
Brian Pedell  
Stewart L. Winger

**College Professor:**  
Corinne B. Stavish

**Senior Lecturers:**  
Kevin A. Kelch

**Lecturers:**  
Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



**BUSINESS MANAGEMENT**

**ACC2013 ACCOUNTING PRINCIPLES 1**

*Prerequisite:* 0. Basic financial accounting principles for a business enterprise. The accounting cycle, merchandising accounts, asset valuation, income measurement, partnership accounting, and corporation accounting. Lect. 3 hrs. *3 hours credit*

**ACC2023 ACCOUNTING PRINCIPLES 2**

*Prerequisite:* ACC2013. Completes the coverage of financial accounting principles and introduces management accounting. Investments, long-term liabilities, the statement of cash flow, consolidated statements, job-order and process cost accounting, special analysis for management, and standard costs. Lect. 3 hrs. *3 hours credit*

**FIN3103 INTRODUCTION TO FINANCE MANAGEMENT**

*Prerequisites:* ACC2023, MCS2113. Overview of the finance function of the firm, financial analysis, planning and budgeting, and the impact of alternative capital structures on the

firm. Emphasis on understanding and utilizing present value and future value concepts. Lect. 3 hrs. *3 hours credit*

**FIN3113 INVESTMENT MANAGEMENT**

*Prerequisite:* FIN3103. Investment opportunities and markets with emphasis on common stocks, bonds, and mutual funds. Reviews various approaches to evaluation and selection of investments. Investor assessment and portfolio management. Lect. 3 hrs. *3 hours credit*

**FIN3203 FINANCE FOR ENTREPRENEURS**

*Prerequisite:* ACC2013 or faculty approval. Students gain working knowledge of general financial/accounting concepts as well as how to obtain appropriate financing for a start-up business venture. Principles are taught and illustrated with the entrepreneur in mind. A combination of lecture/discussion sessions, readings from articles and company prospects, case studies and guest lecturers are used throughout. Lect. 3 hrs. *3 hours credit*

**FIN4013 FINANCIAL INSTITUTIONS**

*Prerequisite:* FIN3103. Evaluation of alternative sources of funds for the firm; short term debt, long term debt, preferred stock, and common stock. Examination of financial institutions including insurance companies, pension funds, banks, mutual funds, and the stock market. Lect. 3 hrs. *3 hours credit*

**HRM3013 ORGANIZATIONAL BEHAVIOR**

*Prerequisite:* Advanced standing. Behavior of and interaction between individuals, small groups, and organizations. Understanding and use of behavioral concepts for the purpose of enhancing personal effectiveness and productivity in organizations. Lect. 3 hrs. *3 hours credit*

**HRM3023 PERSONNEL/HUMAN RESOURCES MANAGEMENT**

*Prerequisite:* MGT2203, Junior standing or faculty approval. An understanding of and proposed solutions to human resources problems in an organization. Personnel testing, interviewing, personnel appraisals, training, management development and wage and salary administration. Lect. 3 hrs. *3 hours credit*

**HRM3043 ORGANIZATION DEVELOPMENT AND MACRO CHANGE THEORY**

*Prerequisite:* HRM3013, HRM3023, or MGT2203 or faculty approval. An intensive course centered on the study of various types of organizational structures, performance and productivity/quality improvement, organizational culture and macro change theory and process. The student is expected to complete an extensive field study and report relevant to the themes of this class. Lect. 3 hrs. *3 hours credit*

**HRM3053 MANAGING BUSINESS RELATIONSHIPS**

*Prerequisite:* HRM3013 or faculty approval. The study of individual leadership style. Appropriate leadership styles needed to effectively work with teams. Students are expected to develop a personal development plan for enhancing their leadership skills and abilities. Lect 3 hrs. *3 hours credit*



**HRM3063 TEAM BUILDING AND GROUP DYNAMICS FOR BUSINESS**

*Prerequisite: HRM3013, HRM3053 or faculty approval.* An intensive course emphasizing application of leadership skills needed for the development of a team. The psychology of group dynamics is explored and practiced through experimental exercises, case studies, written and fieldwork. Lect. 3 hrs. *3 hours credit*

**HRM3073 COMMUNICATIONS FOR BUSINESS LEADERS**

*Prerequisite: HRM3013, MGT2203 or faculty approval.* An applications oriented course developed in a workshop format. Students study and apply skills in technical and professional communications, speech, and advanced interpersonal and non-verbal communication. Work is done in groups and requires the use of computer technology and graphics. Lect. 3 hrs. *3 hours credit*

**HRM4013 EMPLOYEE-MANAGEMENT RELATIONS**

*Prerequisite: MGT3023 or faculty approval.* Review of the historical, legal, and societal forces which shape the present relationship between employers and employees represented by labor unions. After analyzing the bargaining positions of both parties, a simulation of an actual negotiation takes place. Lect. 3 hrs. *3 hours credit*

**HRM4033 HUMAN RESOURCE PROBLEMS AND POLICIES**

*Prerequisites: HRM3013, HRM3023.* Readings and case analyses help examine current management thought and application in a variety of personnel situations. Research project included. Lect. 3 hrs. *3 hours credit*

**HRM4093 INDEPENDENT STUDY IN HUMAN RESOURCES MANAGEMENT**

*Prerequisites: Senior standing and faculty approval.* Under the guidance of a faculty member, students conduct an intensive investigation of a topic within the field of human resources. A written proposal is required for approval. The project typically includes library research, interviews with operating and/or staff managers, and other requirements appropriate to the topic. One of the products of this project is a report. *3 hours credit*

**MGT1212 INTRO TO BUSINESS ISSUES AND PRACTICES**

*Prerequisite: 0.* Introduces the field of business and management through discussion of current business issues and practices. Current business terminology and current ethical issues in the business community are stressed, particularly as they relate to specific business cases. Lect. 2 hrs. *2 hours credit*

**MGT2113 INTRO TO BUSINESS LAW**

*Prerequisite: 0.* Introduction to U.S. legal system and its role in management of business and non-profit organizations. Outline of legal institutions and procedure and their Constitutional basis. Survey of contract, tort, and property law along with regulatory issues of employment, competition, consumer protection, and environmental rules. Lect. 3 hrs. *3 hours credit*

**MGT2203 MANAGEMENT AND SUPERVISION**

*Prerequisite: 0.* The study of management and supervisory concepts from their theoretical bases through their practical applications. Students are given opportu-

nities to learn the art and science of management beginning at the supervisory level. Emphasis on ideas and their results. Exercises, case studies, and other real world examples are an important element of the learning experience. Lect. 3 hrs. *3 hours credit*

**MGT3013 STARTING NEW VENTURES AND MANAGING ENTREPRENEURIAL OPERATIONS**

*Prerequisite: ACC2013, SSC2313, or SSC2323 or faculty approval.* An intensive course focusing on the skills and knowledge necessary to design, launch, and manage a new venture. Practice is accomplished through team projects, case studies, development of a business operating plan for a new venture and meaningful field assignments. Lect. 3 hrs. *3 hours credit*

**MGT3023 ENTREPRENEURIAL MANAGEMENT AND COMMUNICATION**

*Prerequisite: Advanced standing.* An applications oriented course stressing the usage of developing an entrepreneurial idea, maximizing creative potential, sustaining motivation and vision, and managing relationships. Emphasizes the usage of experiential learning, case studies, group discussion, field practice and the usage of computer technology/graphics in communications. Lect. 3 hrs. *3 hours credit*

**MGT3033 ENTREPRENEURIAL MARKETING**

*Prerequisite: ACC2013, SSC2313, or SSC2323 or faculty approval.* An application oriented course covering the marketing concept, the marketing mix, market segmentation, sales tactics for entrepreneurs and effectively utilizing e-commerce in an entrepreneurial environment. Requires fieldwork to develop an actual market plan for a new start-up operation. Lect. 3 hrs. *3 hours credit*

**MGT3043 BUSINESS AND SOCIETY**

*Prerequisite: MGT2203.* The interrelationships of managers and other segments of society owners and directors, employees and customers, labor unions and various governments. The ethics of decision-making and the priorities assigned to resource allocations which affect society. Lect. 3 hrs. *3 hours credit*

**MGT3051-3 MANAGEMENT INTERNSHIP 1**

*Prerequisites: Junior standing and departmental approval.* Directed full work experience in the area of the students designated management major. Advisor approval required. Detailed written report and assigned readings required. (May be used as the equivalent of an independent study in management or be taken for elective credit. Hours of credit designated by the last digit in the course number. The number of hours must be approved by the course advisor.) *1-3 hours credit*

**MGT4003 INDEPENDENT STUDY IN MANAGEMENT**

*Prerequisite: 0.* Under the guidance of a faculty member, students conduct an intensive investigation of a topic within the field of management. A written proposal is required for approval. Projects typically include library research, interviews with operating and/or staff managers, and other requirements appropriate to the topic. One of the products of this project is a report. *3 hours credit*

**MGT4013 INTERNATIONAL BUSINESS**

*Prerequisites: MGT2203, FIN3103, MKT2013.* Exploration of the multi-faceted topics necessary to develop and nurture the international dimension of business. Geography, cultural differences, (including religions), economics, politics, regional alliances, transportation modes, exchange mechanisms and rates, balance of payments, tariffs, quotas, assisting agencies, trade documents and agencies, and various options for entering foreign markets such as exporting, licensing and manufacturing. Lect. 3 hrs. *3 hours credit*

**MGT4051-3 MANAGEMENT INTERNSHIP 2**

*Prerequisites: MGT3053 and departmental approval.* Direct full-time work experience in the area of the students designated management major. Advisor approval required. Detailed written report and assigned readings required. (May be used as the equivalent of an independent study in management or be taken for elective credit. Hours of credit designated by last digit in the course number. The number of hours must be approved by the course advisor.) *1-3 hours credit*

**MGT4093 INDEPENDENT STUDY IN MANAGEMENT**

*Prerequisites: Senior standing and faculty approval.* Under the guidance of a faculty member, students conduct an intensive investigation of a topic within the field of management. A written proposal is required for approval. Projects typically include library research, interviews with operating and/or staff managers, and other requirements appropriate to the topic. One of the products of this project is a report. *3 hours credit*

**MGT4143 MANAGEMENT QUALITY CONTROL**

*Prerequisite: MCS2113.* Issues of quality in the entire firm from a management perspective. Traditional quality control tools as well as various schools of thought on the subject of quality in the work place. (Required course for Operations Management and B.S.I.M. students.) Lect. 3 hrs. *3 hours credit*

**MGT4213 STRATEGIC MANAGEMENT**

*Prerequisites: Senior standing, MGT2203, FIN3103, MKT3013.* The capstone course in the series of required management courses. Demonstrates how knowledge from various study areas contributes to the formulation of management policies and strategies. Case studies are used extensively. Lect. 3 hrs. *3 hours credit*

**MKT3013 PRINCIPLES OF MARKETING**

*Prerequisite: Advanced standing.* The marketing concept, the marketing mix, target markets and the environment within which marketers work. The process of marketing is examined from the macro and micro views as well as from an international perspective. Lect. 3 hrs. *3 hours credit*

**MKT3023 SELLING AND SALES MANAGEMENT**

*Prerequisite: Junior standing.* The selling function and its role in the business firm and our society. The selling process is studied, discussed, and practiced. Prospecting, the preapproach, the art of persuasion, making the sales presentation, handling objections, closing the sale, and servicing accounts after the sale. The management of the selling function. Lect. 3 hrs. *3 hours credit*

**MKT3033 ENTREPRENEURIAL MARKETING**

*Prerequisite: ACC2013, SSC2313, or SSC2323 or faculty approval.* An application oriented course covering the marketing concept, the marketing mix, market segmentation, sales tactics for entrepreneurs and effectively utilizing e-commerce in an entrepreneurial environment. Requires fieldwork to develop an actual market plan for a new start-up operation. Lect. 3 hrs. *3 hours credit*

**MKT3043 LOGISTICS MANAGEMENT**

*Prerequisite: Advanced standing.* The flow of materials within an individual firm and between a firm and its suppliers and customers. The system's view of the logistic functions of transportation, inventory control, materials acquisition and handling, warehousing, order processing, protective packaging, facility location and design, and the analysis and impact of customer service within the system. Lect. 3 hrs. *3 hours credit*

**MKT3073 TECHNICAL SALES**

*Prerequisite: Advanced standing.* Sales in the context of technologically advanced products and sophisticated buyers. Presentation, persuasion, contracting, and maintaining relationships in rapidly changing markets. Lect. 3 hrs. *3 hours credit*

**MKT4093 INDEPENDENT STUDY IN MARKETING**

*Prerequisites: Senior standing and faculty approval.* Under the guidance of a faculty member, students conduct an intensive investigation of a topic within the field of marketing. A written proposal is required for approval. Projects typically include library research, interviews with operating and/or staff managers, and other requirements appropriate to the topic. One of the products of this project is a report. *3 hours credit*

**COMMUNICATIONS**

**COM0074 SUMMER WRITING WORKSHOP**

*Prerequisite: Placement.* An intensive four and one-half week course focusing on basic reading and writing skills, grammar, sentence structure, paragraphing, essay organization, and revision. Structured as a workshop and much of the work in class will include group writing and reading practice. Students who receive a grade of "C" or better will be placed into English Composition (COM1103). Lect. 4 hrs. *4 hours credit*

**COM0075 UNIVERSITY COMPOSITION 1**

*Prerequisite: Placement.* First in a two-part intensive writing sequence. Principles of English composition are emphasized, with a focus on writing short expository essays that follow the conventions for sentence structure, paragraphing, word choice and punctuation. Extensive writing and reading practice is required, as well as scheduled conferences with instructor. Lect. 5 hrs. *5 hours credit*

**COM0094 ENGLISH FUNDAMENTALS**

*Prerequisite: Placement.* Principles of English composition are emphasized. Focus on basic writing skills, grammar, development of thesis statements, topic sentences, transitional words and phrases, supporting paragraphs, and essay organization. Extensive writing practice is required. Lect. 4 hrs. *4 hours credit*

**COM0104 ENGLISH FUNDAMENTALS FOR NON-NATIVE SPEAKERS**

*Prerequisite: Placement.* A version of English fundamentals designed to address the specific needs of non-native speakers of English. English grammar, usage and style. Extensive practice in basic writing skills and in the writing of essays. Lect. 4 hrs. *4 hours credit*

**COM1001 UNIVERSITY SEMINAR**

*Prerequisite:* 0. Development of effective study skills including using textbooks, acquiring listening and note-taking skills, using library and computer resources, managing time, and preparing for and taking exams, and participating in group projects. Lect. 1 hr. *1 hour credit*

**COM1002 UNIVERSITY STUDIES SEMINAR**

*Prerequisite:* 0. Development of college-level study methods including analysis of textbooks, listening and note-taking skills, library and computer abilities, and examination techniques. Short reading and writing assignments to familiarize the student with grading standards and procedures. Nature and role of universities in a diverse and computer-driven society. Replaces COM1001 for University Studies students. Lect. 2 hrs. *2 hours credit*

**COM1075 UNIVERSITY COMPOSITION 2**

*Prerequisite:* COM0075. The second in a two-part intensive writing sequence. Fundamental skills of reading, reasoning, and writing are emphasized. Focuses on reading and analysis of literature and upon basic writing skills such as thesis, organization, support and development of ideas, and documentation. Expository essays and a research paper are required as well as scheduled conferences with the instructor. Satisfies English Composition requirement for University Studies students. Lect. 5 hrs. *5 hours credit*

**COM1103 ENGLISH COMPOSITION**

*Prerequisite:* Placement, COM0074, COM0094, or COM0104. The basic principles of English composition and the development of ideas in written work. Fundamentals of research techniques are emphasized. Extensive readings and frequent themes are required. Lect. 3 hrs. *3 hours credit*

**COM2103 TECHNICAL AND PROFESSIONAL COMMUNICATION**

*Prerequisite:* COM1103 or COM1075. Training in a systematic method for producing effective technical communication, written reports, letters, and memos as well as oral presentations. Lect. 3 hrs. *3 hours credit*

**COM2113 SPEECH**

*Prerequisite:* 0. Principles of individual and group speaking. Emphasis on group speaking situations and argumentative speaking. Lect. 3 hrs. *3 hours credit*

**COM2443 INTRODUCTION TO RHETORIC AND LOGIC**

*Prerequisite:* COM2103. The origins of rhetoric and logic, with special emphasis on the discipline as a practical, productive art. Analysis of reasoning and fallacies; theory of logic and rhetoric; Venn diagrams and syllogisms. Critical examination of texts. Formal logic and rhetoric in oral and written presentations. Lect. 3 hrs. *3 hours credit*

**COM3103 ADVANCED PROFESSIONAL COMMUNICATION**

*Prerequisite:* COM2103. Use of a variety of oral and written communication skills in various business and professional applications. Most course work done in groups. Use of computer technology and graphics. Lect. 3 hrs. *3 hours credit*

**COM3453 RESEARCH PRINCIPLES AND METHODS**

*Prerequisite:* COM2103. Examination of principles and methods of gathering information for technical and scientific research projects from print-based, computerized, and electronic resources (including the Internet), and from interviews. Bibliographic methods and accepted forms of documentation also introduced. Lect. 3 hrs. *3 hours credit*



**COM3463 COLLABORATIVE COMMUNICATION**

*Prerequisite:* COM2103 or instructor's permission; *Co-requisite:* COM2113. Intensive examination of small group communication focusing on the role and procedures of groups in the professional world. Group theory, power structure, teamwork, critical analysis, leadership styles, and problem solving. Lect. 3 hrs. *3 hours credit*

**COM3473 DOCUMENT DESIGN**

*Prerequisite:* COM2103. Emphasis on the concepts of layout and design of technical documents, documents for publication, presentation support materials, and electronic media. Lect. 3 hrs. *3 hours credit*

**COM3483 PRESENTATION MEDIA**

*Prerequisite:* COM2103; *co-requisite:* COM2113. The systematic design, production, and use of presentation media. Emphasis on developing business-oriented presentations using traditional multimedia presentation support. Lect. 3 hrs. *3 hours credit*

**COM3543 TECHNICAL EDITING**

*Prerequisites:* COM2103 and COM2443. Application of technical editing skills, including substantive editing, copy editing, and proofreading. Evaluating text and visuals for specialized audiences. Lect. 3 hrs. *3 hours credit*

**COM3553 INTERPERSONAL AND NONVERBAL COMMUNICATION**

*Prerequisite: COM2103.*  
 Overview of interpersonal communication and focus on relations in the professional world. Listening skills, nonverbal communication, language analysis, conflict management, and intercultural communication.  
 Lect. 3 hrs. 3 hours credit

**COM4111-3 INTERNSHIP OR SENIOR PROJECT**

*Prerequisite: Junior/Senior standing and permission of advisor.*  
 Under the supervision of an advisor, students apply knowledge gained in course work to a practical work environment, through an internship with a local company or a specially designed work project. Student's progress evaluated through a task log, project or work portfolio, final report, and evaluation report. 1-3 hours credit

**COM4121-3 INTERNSHIP OR SENIOR PROJECT 2**

*Prerequisite: COM4113.*  
 Continuation of COM4113.  
 1-3 hours credit

**COM4133 MULTIMEDIA STUDIO**

*Prerequisite: COM2103; co-requisites: COM3473, COM3483.*  
 Study and application of multimedia hardware, software, and design techniques. Emphasis on design techniques, industry standards, and application in business and industrial environments.  
 Lect. 3 hrs. 3 hours credit

**COM4143 DESKTOP PUBLISHING**

*Prerequisites: COM2103, COM3473.* Application of the principles of document design using computerized desktop publishing software to produce print-based publications. Students work in groups to design and produce short print and electronic pieces (newsletter, brochure, etc.) for specialized audiences. Lect. 3 hrs. 3 hours credit

**COM4153 WRITING PROPOSALS**

*Prerequisites: COM2103, COM2443, COM3543.* The basic principles of writing proposals that seek organizational support and funding. Methods for identifying funding sources and analyzing the needs of the target audience. Lect. 3 hrs. 3 hours credit

**COM4963 SEMINAR IN COMMUNICATIONS**

*Prerequisites: COM2103, Junior standing, and permission of the program director.* Intensive study of a technical communication topic. Readings, written assignments, and group work will support the course theme. Lect. 3 hrs. 3 hours credit

**COM5963 WEB SITE DESIGN**

*Prerequisites: COM3473 and COM4143, or COM6103, or permission of instructor.* A comprehensive introduction to the principles and practices of effective content and graphic design for web sites. Application of techniques and software tools for organizing web site information and for writing and editing texts presented in this digital communication medium. Lect. 3 hrs. 3 hours credit

**ENGLISH AS A SECOND LANGUAGE**

**ESL0013 ENGLISH AS A SECOND LANGUAGE**

Provides opportunities for learning oral and written language communication skills. Intensive English course for students for whom English is a second language. 3 credit hours

**ESL0041 ENGLISH VOCABULARY**

Introduces students to a comprehensive range of vocabulary with the express purpose of enhancing their proficiency in all aspects and types of academic, scientific, and professional interaction in English. Each week, approximately 100 new vocabulary items are introduced and explained in a meaningful context. Particular attention is given to Latin and Greek terms, productive morphemes, and affixes. Pronunciation and grammar are dealt with as the situation calls for it. Among the concrete results expected from successful completion of this course are: enhanced comprehension of university texts and lectures; faster, more effective reading; increased conversational fluency; and more confidence in one's ability to communicate in English. Studio 3 hrs. 1 hour credit

**ESL0140 ESL I**

Constitutes the beginning of the ESL curriculum sequence. Accordingly, it is an intensive course with 12 contact hours weekly. The four major content areas are emphasized, namely reading, academic writing, speaking skills, and grammar. Students who successfully complete this course are expected to exhibit moderate proficiency in English pronunciation with the ability to carry on a fairly complex conversation in standard English. Furthermore, their writing should be readable and reasonably free of major grammatical and structural errors. Because student participation is vital to success in ESL, performance in regularly-scheduled group activities and presentation skills is very important. 0 hours credit

**ESL0210 ESL II**

*Prerequisite: ESL 0140.* This course is the continuation of ESL0140 for those who have performed at a very high level of proficiency therein. The four major

content areas are emphasized, namely reading, academic writing, speaking skills, and grammar, but at a higher level than the less advanced course. Students who successfully complete this course are expected to exhibit moderate to high proficiency in English pronunciation, enabling them to carry on a comprehensible conversation in standard English. Furthermore, their writing should be very readable and without an excessive amount of interference from the native language. 0 hours credit

**ESL0220 CONTINUING ESL II**

*Prerequisite: ESL0140.* This course is the continuation of ESL0140. It emphasizes the four major content areas: reading, academic writing, speaking skills, and grammar. As the second semester of ESL instruction, students who successfully complete this course are expected to exhibit moderate proficiency in English pronunciation, enabling them to carry on a reasonably comprehensible conversation in standard English. Furthermore, their writing should be readable and without an excessive amount of interference from the native language. 0 hours credit

**ESL0310 ESL III**

*Prerequisite: ESL0210 or ESL0220.* This course emphasizes the four major content areas: reading, academic writing, speaking skills, and grammar. As it is the third semester of ESL introduction, students are expected to exhibit advanced proficiency in English pronunciation. Additionally, students are expected to be able to carry on a normal conversation on a wide variety of topics comprehensible to a native speaker of English. Furthermore, their writing should be relatively free of grammatical mistakes and exhibit a high degree of fluency. 0 hours credit



LANGUAGE AND LITERATURE

**The writing proficiency exam is a prerequisite to all language and literature (LLT) junior/senior elective courses.**

**LLT1213 WORLD MASTERPIECES 1**

*Prerequisite:* COM1103 or COM1075. Exploration of the great works of world literature and art in their historical contexts so that students may discover the variety and development of human thought and feeling in various cultures. Works of the Classical, Medieval, and Renaissance periods in Europe as well as Asian and Middle-Eastern works that have influenced the West, in the forms of poetry, drama, fiction, visual art, and music. A writing-intensive course requiring outside papers and essay tests. Approximately 80 percent of the course is devoted to the study of literature. Lect. 3 hrs. *3 hours credit*

**LLT1223 WORLD MASTERPIECES 2**

*Prerequisite:* COM1103 or COM1075. A continuation of World Masterpieces 1. Works of the Neoclassical, Romantic, Modern, and Post-Modern eras in Europe and North America, as well as works from Asia, Africa, and Latin America. Works selected may include poetry, drama, fiction, the visual arts, and music. A writing-intensive course requiring outside papers and essay tests. Approximately 80 percent of the course is devoted to the study of literature. Lect. 3 hrs. *3 hours credit*

**LLT2613 GERMAN 1**

*Prerequisite:* 0. An introduction to basic German grammar and vocabulary includes easy reading and oral drill. No credit for LLT2613 without the completion of LLT2623. Lect. 3 hrs. *3 hours credit*

**LLT2623 GERMAN 2**

*Prerequisite:* LLT2613. Further study of German grammar and vocabulary. Lect. 3 hrs. *3 hours credit*

**LLT2713 JAPANESE 1**

*Prerequisite:* 0. Beginning study of the Japanese language introducing the hiragana and katakana syllabaries and the acquisition of vocabulary, idiomatic phrases, and grammar. A survey of Japanese history to 1185 A.D. No credit for LLT2713 without the completion of LLT2723. Lect. 3 hrs. *3 hours credit*

**LLT2723 JAPANESE 2**

*Prerequisite:* LLT2713. Continuation of the study of Japanese language and history, stressing completion of the hiragana syllabary and progress in the katakana syllabary. Continued acquisition of vocabulary, idiomatic phrases, and grammar. Lect. 3 hrs. *3 hours credit*

**LLT2913 SPANISH 1**

*Prerequisite:* 0. Spanish vocabulary and grammar; with oral and written work. Aspects of Hispanic culture and civilization. No credit for LLT2913 without the completion of LLT2923. Lect. 3 hrs. *3 hours credit*

**LLT2923 SPANISH 2**

*Prerequisite:* LLT2913. Continuation of Spanish vocabulary and grammar, with oral and written work. Aspects of Hispanic culture and civilization. Lect. 3 hrs. *3 hours credit*

**LLT3113 ENGLISH LITERATURE TO 1800**

*Prerequisites:* LLT1213, LLT1223. A survey of masterpieces of English poetry, prose, and drama from Beowulf through the late Middle Ages; the Elizabethan era; the 17th century, including the metaphysicals and Milton; the Neoclassical period; and the rise of the novel in the 18th century. Lect. 3 hrs. *3 hours credit*

**LLT3123 ENGLISH LITERATURE 1800-1914**

*Prerequisites:* LLT1213, LLT1223. Continues the survey of English literature. The first half emphasizes the poetry of the major Romantics (Blake, Wordsworth, Coleridge, Byron, Shelley, Keats). The second half takes up the crisis of conscience in society, art and religion that characterizes the Victorian period. Here, the emphasis falls on major non-fiction writers as well as poets. A Victorian novel may be included. Lect. 3 hrs. *3 hours credit*

**LLT3213 AMERICAN LITERATURE TO 1900**

*Prerequisites:* LLT1213, LLT1223. Critical study of significant American writing. Works are selected for literary merit and to reveal developments in American culture from the early English settlers' arrival to the 20th century. Lect. 3 hrs. *3 hours credit*

**LLT3223 AMERICAN LITERATURE: 1900 TO PRESENT**

*Prerequisites:* LLT1213, LLT1223. Great American essays, short stories, poetry, plays, and novels and their historical and cultural influences. Lect. 3 hrs. *3 hours credit*

**LLT3513 THE NOVEL**

*Prerequisites:* LLT1213, LLT1223. A survey of the novel as an art form and as social history. Authors may range from Cervantes through Dickens, Flaubert, Joyce, Woolf, Faulkner, and Rushdie. Representative authors are chosen to illustrate particular narrative techniques as well as each period's concerns. Lect. 3 hrs. *3 hours credit*

**LLT3523 WOMEN IN LITERATURE**

*Prerequisites:* LLT1213, LLT1223. Literature by and about women from the classical period to the present. The rise of patriarchal society and its effects on culture. The significance of cultural changes, as reflected in literature, for women and society. Lect. 3 hrs. **3 hours credit**

**LLT3533 CONTEMPORARY LITERATURE**

*Prerequisites:* LLT1213, LLT1223. A study of contemporary world literature presented within a social, cultural, and political context. Lect. 3 hrs. *3 hours credit*

**LLT3543 MODERN POETRY**

*Prerequisites:* LLT1213, LLT1223. A survey of major 20th century poets, worldwide. Aesthetic, philosophical and psychological questions form the basis for discussion and analysis. Lect. 3 hrs. *3 hours credit*

**LLT3613 LITERATURE AND ART**

*Prerequisites:* LLT1213, LLT1223. The close connections between literature, painting, architecture and music, and how the various arts express the spirit of the times and help to shape it. Classical, romantic, realist, and other trends are traced. Emphasis on literary work. Lect. 3 hrs. *3 hours credit*

**LLT3623 LITERATURE AND SCIENCE**

*Prerequisites:* LLT1213, LLT1223. The relationship between literature and science from 1660 to the present, including literature as commentary on science. Lect. 3 hrs. *3 hours credit*

**LLT3643 LITERATURE INTO FILM**

*Prerequisites: LLT1213, LLT1223.* The metamorphosis of selected literature into film. Objective is to recognize the essence of each medium and to question the influence of literature and film on social and cultural thought. Lect. 3 hrs. Course fee. 3 hours credit

**LLT3713 DRAMA: HISTORY AND THEORY**

*Prerequisites: LLT1213, LLT1223.* All aspects of the theater, including play content, historical development, staging, costume, make-up. Reading and performance of world drama; viewing and criticism of live productions. Lect. 3 hrs. 3 hours credit

**LLT4113 EARLY SHAKESPEARE**

*Prerequisites: LLT1213, LLT1223.* Shakespeare's early career in its historical context. Church drama and the morality play are discussed as the tradition from which Renaissance theater developed. Representative works by the playwright's contemporaries may be included. Emphasis on selected Shakespearean comedies, early tragedies and history plays to 1599. Lect. 3 hrs. 3 hours credit

**LLT4123 LATER SHAKESPEARE**

*Prerequisites: LLT1213, LLT1223.* The second half of Shakespeare's career in its historical context. The playwright's work as it changed from the period of the major tragedies early in the 17th century to the romances composed before his death in 1616. Works by later contemporaries may be included. Lect. 3 hrs. 3 hours credit

**LLT4513 SEMINAR IN LITERATURE**

*Prerequisites: LLT1213, LLT1223, and Junior standing or permission of department chairperson.* Intensive study of a literary topic determined by the instructor. Assigned readings and class dis-

cussion culminating in a major paper written under the instructor's guidance. Lect. 3 hrs. 3 hours credit

**LLT4523 CREATIVE WRITING**

*Prerequisites: LLT1213, LLT1223.* The application of creative writing techniques through experimentation with various literary genres: poetry, fiction and drama, and critical evaluation. May be repeated for credit with a different instructor. Lect. 3 hrs. 3 hours credit

**LLT4533 LITERARY CRITICISM**

*Prerequisites: LLT1213, LLT1223.* An historical approach to the examination of the classic texts of literary criticism with opportunities for students to apply the principles of criticism to selected literary works. Lect. 3 hrs. 3 hours credit

**LLT4634 GERMAN 3**

*Prerequisite: LLT2623.* A continuation of German language study, with emphasis on vocabulary development, pronunciation, reading and conversational skill. Lect. 4 hrs. 4 hours credit

**LLT4644 GERMAN 4**

*Prerequisite: LLT4634.* The translation of technical articles in chemistry, physics, or mathematics. If desired, students may also select readings from contemporary literature. Lect. 4 hrs. 4 hours credit

**LLT4734 JAPANESE 3**

*Prerequisite: LLT2723.* Continued practice in spoken and written Japanese, with background from modern social and cultural history. Lect. 4 hrs. 4 hours credit

**LLT4744 JAPANESE 4**

*Prerequisite: LLT4734.* Continuing expansion of skills in spoken Japanese, combined with appropriate readings in Japanese literature and other aspects of Japanese culture. Lect. 4 hrs. 4 hours credit

**LLT4833 SPANISH 3**

*Prerequisite: LLT2923.* Review of essential grammatical structures and further training in spoken and written Spanish; introduction to Spanish literature. Lect. 3 hrs. 3 hours credit

**LLT4843 SPANISH 4**

*Prerequisite: LLT4833.* Development of oral and written proficiency, with emphasis on business and professional use; further study of Spanish literature. Lect. 3 hrs. 3 hours credit

**LLT4903 SENIOR THESIS IN LITERATURE**

*Prerequisite: Permission of department chair.* Supervised writing of an essay that demonstrates depth and breadth in the analysis of literature. Students will give a public presentation of their Senior Thesis. Lect. 3 hrs. 3 hours credit

**LLT4913 MYTHOLOGY**

*Prerequisites: LLT1213, LLT1223.* Examination of the origins and cultural significance of this oldest form of literature with emphasis on commonality of themes and continued influence in modern society. Readings in classical, Norse, Native American, and African myths. Lect. 3 hrs. 3 hours credit

**LLT4923 MODERN WORLD LITERATURE**

*Prerequisites: LLT1213, LLT1223.* Modern masterpieces of world literature and their influence on present social, cultural, and political thought. Lect. 3 hrs. 3 hours credit

**LLT4991-3 DIRECTED STUDY IN LANGUAGE AND LITERATURE**

*Prerequisite: Permission of department chair.* Study of a special topic under the direction of a member of the department. 1-3 hours credit

**LLT5991-3 DIRECTED STUDY IN LANGUAGE AND LITERATURE**

*Prerequisite: Permission of department chair.* Directed study with reports from students who wish to undertake individual readings and study on approved topics. 1-3 hours credit

**PSYCHOLOGY**

**PSY1001 THE WORLD OF THE MIND**

*Prerequisite: 0.* An introduction to the challenges and rewards of the profession of psychology. Lect. 1 hr. 1 hour credit

**PSY1213 INTRODUCTORY PSYCHOLOGY**

*Prerequisite: 0.* Introduction to the study of motives at work in human behavior; understanding of perception, reasoning, memory, consciousness, intelligence, psychopathology, and individual differences. Lect. 3 hrs. 3 hours credit

**PSY3113 RESEARCH METHODS FOR THE BEHAVIORAL SCIENTIST**

*Prerequisites: PSY1213 and MCS2123.* Statistical and other computational methods applicable to psychological procedure; hypothesis testing, sampling problems, interpretation of results. Lab 3 hrs. 3 hours credit

**PSY3213 COGNITIVE PSYCHOLOGY**

*Prerequisite: PSY1213.* An exploration of historical and contemporary research and theory concerned with cognitive processes including attention, memory, problem solving and concept formation. Lect. 3 hrs. 3 hours credit

**PSY3221 LAB IN COGNITIVE PSYCHOLOGY**

*Prerequisite: PSY1213; co-requisite: PSY3213.* Laboratory work emphasizing a presentation of methods of research assessing human attention, memory, and problem-solving processes. Research, design, data analysis, and research report writing are also emphasized. Lab 1 hr. *1 hour credit*

**PSY3313 INDUSTRIAL PSYCHOLOGY**

*Prerequisite: PSY1213.* Psychology as applied to business and industry. Major areas of industrial psychology: selection, placement, and training procedures; human factors research. Industrial social psychology: motivational and organizational research and theory. Lect. 3 hrs. *3 hours credit*

**PSY3323 ORGANIZATIONAL PSYCHOLOGY**

*Prerequisite: PSY1213.* Major concepts, theories, and empirical research related to organizational psychology. Includes: work motivation, leadership, decision making, and job satisfaction as well as more recent trends such as cultural diversity, work teams, work-family, and quality issues. Lect. 3 hrs. *3 hours credit*

**PSY3413 SENSATION AND PERCEPTION**

*Prerequisite: PSY1213.* Reading and discussion concerning psychophysical methods, sensory physiology, phenomenology of various sensory systems, and theories of the perceptual process. Lect. 3 hrs. *3 hours credit*

**PSY3421 SENSATION AND PERCEPTION LAB**

*Prerequisite: PSY1213; co-requisite: PSY3413.* Laboratory work is coordinated and designed to increase comprehension of psychology as a laboratory science in general and the experimental

study of the perceptual process in particular. Emphasis on the development of skills involved in the design of experiments, data collection, data analysis, reasoning about experimental results, and scientific report writing. Lab 1 hr. *1 hour credit*

**PSY3613 DEVELOPMENTAL PSYCHOLOGY**

*Prerequisite: PSY1213 or permission of instructor.* The biological, cognitive, and personality changes that take place as a person ages and the causes of those changes. Lect. 3 hrs. *3 hours credit*

**PSY3623 SOCIAL PSYCHOLOGY**

*Prerequisite: PSY1213.* The psychology of group behavior: the interaction between the psychological and social systems. Lect. 3 hrs. *3 hours credit*

**PSY3633 ABNORMAL PSYCHOLOGY**

*Prerequisite: PSY1213.* The causes, symptoms and treatment of behavior disorders, personality disturbances, and mental illness. Lect. 3 hrs. *3 hours credit*

**PSY4111-3 INTERNSHIP OR SENIOR PROJECT**

*Prerequisite: Junior/senior standing and permission of advisor.* Under the supervision of an advisor, students apply knowledge gained in course work to a practical work environment, through internship with a local company, practice, or hospital, or a specially designed work project. May be taken up to six credits. *1-3 hours credit*

**PSY4213 BEHAVIORAL NEUROSCIENCE**

*Prerequisite: PSY3213.* A comprehensive study of the relationship of the nervous and other organ systems to behavior. Research on both human and other animal species is considered. Lect. 3 hrs. *3 hours credit*

**PSY4221 BEHAVIOR NEUROSCIENCE LAB**

*Prerequisite: PSY3413; co-requisite: PSY4213.* Laboratory course designed to introduce the techniques and procedures of physiological psychology. Scientific report writing, problems of research design, and data analysis also are emphasized. Lab 1 hr. *1 hour credit*

**PSY4313 DRUGS AND BEHAVIOR**

*Prerequisite: PSY1213.* Function of neurotransmitters and neurochemicals. Effect of drugs on brain chemistry. Addiction and associated behavior. Lect. 3 hrs. *3 hours credit*

**PSY4413 HISTORY AND SYSTEMS OF PSYCHOLOGY**

*Prerequisite: PSY1213.* A study of the origins, development, and nature of psychology and its relation to external events; emphasis on the period since 1875. Lect. 3 hrs. *3 hours credit*

**PSY4513 ANIMAL BEHAVIOR**

*Prerequisite: PSY1213.* A study of behavior of diverse animals for the understanding of the relationship between nervous integration and the behavior manifested by the organism, as well as the evolution and adaptive significance of behavior as a functional unit. Lect. 3 hrs. *3 hours credit*

**PSY4633 CLINICAL PSYCHOLOGY**

*Prerequisite: PSY1213.* A broad survey of problems and practices in the diagnosis and treatment of behavioral disorders. Lect. 3 hrs. *3 hours credit*

**SOCIAL SCIENCES**

**The writing proficiency exam is a prerequisite to all social sciences (SSC) junior/senior elective courses.**

**SSC2303 PRINCIPLES OF ECONOMICS**

*Co-requisite: MCS0054 or equivalent.* Survey of macroeconomics and microeconomics, with emphasis on fundamental tools of economic analysis and policy. Introduction of supply and demand, national income determination, theory of the firm, and market structure. Lect. 3 hrs. *3 hours credit*

**SSC2313 PRINCIPLES OF MACROECONOMICS**

*Co-requisite: MCS0054 or equivalent.* Introduction to macroeconomics, including measurement of aggregate economic variables, determination of national income, Keynesian model, monetary and banking policy; international economics. Lect. 3 hrs. *3 hours credit*

**SSC2323 PRINCIPLES OF MICROECONOMICS**

*Co-requisite: MCS0054 or equivalent.* Introduction to microeconomics, including utility theory, elasticity, theory of the firm, market structure, market failure, and regulatory policy. Lect. 3 hrs. *3 hours credit*

**SSC2413 FOUNDATIONS OF THE AMERICAN EXPERIENCE**

*Prerequisite: COM1075 or co-requisite: COM1103.* Aspects of philosophy, political theory, science, art and religion, from ancient Egypt to 1789, as they have contributed to the formation of the American experience. Readings include selections from Plato, Aristotle, Machiavelli, Hobbes, and other important thinkers. The student's ability to reflect critically upon the major

ideas, values, institutions, events and personalities that have helped to shape the contemporary United States is emphasized. Seeks to foster an attitude of critical engagement and to develop students' writing and oral skills through papers and class participation. Lect. 3 hrs. *3 hours credit*

**SSC2423 DEVELOPMENT OF THE AMERICAN EXPERIENCE**

*Prerequisite: SSC2413.* A continuation of the study of philosophy, political theory, science, art and religion begun in Foundations of the American Experience. Discusses the framing of the United States Constitution in the late 18th century, and examines the works of important American thinkers and the important social documents of the 19th and 20th centuries. Both primary texts and selected readings in issues of contemporary importance are read. Develops students' writing and verbal skills through written assignments and class presentations. Lect. 3 hrs. *3 hours credit*

**SSC3133 HISTORY OF EUROPE TO 1500**

*Prerequisites: SSC2413 and SSC2423.* The development of European civilization from the Greeks to the Renaissance; analysis of the principal forces of change at work during this period. Lect. 3 hrs. *3 hours credit*

**SSC3143 HISTORY OF EUROPE SINCE 1500**

*Prerequisites: SSC2413 and SSC2423.* The emergence of modern Europe in its principal political, economic, social, cultural and intellectual aspects. Lect. 3 hrs. *3 hours credit*

**SSC3153 AMERICAN HISTORY TO 1877**

*Prerequisites: SSC2413 and SSC2423.* The principal political, economic, social, and cultural factors which shaped colonial America and led to the American Revolution; the Constitution, westward expansion, the Civil War, and Reconstruction. Lect. 3 hrs. *3 hours credit*

**SSC3163 AMERICAN HISTORY SINCE 1877**

*Prerequisites: SSC2413 and SSC2423.* The United States since the end of Reconstruction. The Progressive Era, World War I, the Great Depression, World War II, the civil rights movement, the women's movement, the Cold War and Viet Nam, and the information age. Lect. 3 hrs. *3 hours credit*

**SSC3173 AMERICAN POLITICAL TRADITION**

*Prerequisites: SSC2413 and SSC2423.* The American political tradition and the men and women who made it. Readings on selected issues in American political history. Among topics included are: 18th-century republicanism, the origins of the Republican and Democratic parties, the history of political party systems, and the rise of the social welfare state in the 20th century. Selected issues in international relations, civil rights, and women's contributions to the polity. Written assignments and classroom presentations required. Lect. 3 hrs. *3 hours credit*

**SSC3183 AMERICAN INTELLECTUAL TRADITION**

*Prerequisites: SSC2413 and SSC2423.* Major currents in American intellectual history. Selections from Ralph Waldo Emerson, William James, John Dewey and other thinkers in exploration of major paradigms in

American intellectual history from the 17th to the 20th centuries. Among philosophical issues examined are the Enlightenment and its critics, American transcendentalism, and American pragmatism. Written assignments and classroom presentations. Lect. 3 hrs. *3 hours credit*

**SSC3253 GOLDEN AGE OF GREECE**

*Prerequisites: SSC2413 and SSC2423.* The Greek Golden Age of the 5th century, B.C., emphasizing the philosophy, drama, architecture and sculpture, and daily life of Athens, viewed with the general historical and social conditions of the period. Lect. 3 hrs. *3 hours credit*

**SSC3273 CONCEPTS OF HUMAN NATURE**

*Prerequisites: SSC2413 and SSC2423.* The way in which man or human nature has been defined through the ages from the early Greek philosophers to modern interpretations. Special emphasis on modern psychological, philosophical, and religious theory. Implications of such concepts for contemporary life. Lect. 3 hrs. *3 hours credit*

**SSC3283 HISTORY OF MICHIGAN**

*Prerequisites: SSC2413 and SSC2423.* A survey from prehistoric time to the present, with emphasis on Michigan in national and international contexts. Lect. 3 hrs. *3 hours credit*

**SSC3313 HISTORY AND PHILOSOPHY OF SCIENCE**

*Prerequisites: SSC2413 and SSC2423.* The history and development of scientific thought with special emphasis on the rational and irrational bases of the scientific endeavor. Lect. 3 hrs. *3 hours credit*

**SSC3343 INTERMEDIATE MICROECONOMICS**

*Prerequisites: MCS1224 and either SSC2303 or SSC2323.* Analysis of price and output determination, demand and cost theory, intertemporal decision-making, welfare economics, market structure and antitrust policy. Lect. 3 hrs. *3 hours credit*

**SSC3353 ANTHROPOLOGY**

*Prerequisite: Sophomore standing.* Introduction to theory and methodology in social science and the role of culture in shaping human society; examination of cross-cultural diversity in belief systems, traditions, and material culture; and consideration of ethical problems in applied anthropology. Lect. 3 hrs. *3 hours credit*

**SSC3383 INTERNATIONAL ECONOMICS**

*Prerequisite: SSC2303 or SSC2313.* International trade and finance. Gains from trade, barriers to trade, customs unions, technology transfer; currency exchange rates, international capital flows; balance of trade and balance of payments. Lect. 3 hrs. *3 hours credit*

**SSC3413 INTRODUCTION TO AFRICAN AMERICAN STUDIES**

*Prerequisites: SSC2413 and SSC2423.* Introduces key aspects of the African-American experience in the United States, including: an historical survey of major trends, issues, and forces, a study of the contemporary status of African-Americans; and a view of how they order their lives and define their futures through cultural, social, and political institutions and expressions. Lect. 3 hrs. *3 hours credit*



**SSC3433 JAPANESE HISTORY AND CULTURE**

*Prerequisites:* SSC2413 and SSC2423. A survey of the development of the Japanese people from historical and geographic analysis with emphasis on the social, political, economic, and educational life of Japan. Lect. 3 hrs. 3 hours credit

**SSC3513 INDUSTRIAL ECONOMICS**

*Prerequisite:* SSC2303 or faculty approval. A survey of the applied microeconomics of market structures, with particular reference to economies of scale, barriers to entry, market failure, antitrust, and regulation. Emphasis on industrial, retail, and nonfinancial service sectors. Lect. 3 hrs. 3 hours credit

**SSC3523 MONEY AND BANKING**

*Prerequisite:* SSC2303 or faculty approval. Monetary systems; in-depth analysis of the banking system in the United States with particular emphasis on expansion of money supply; assets and liability management and implications for investors and consumers. Lect. 3 hrs. 3 hours credit

**SSC3713 TOPICS IN PHILOSOPHY**

*Prerequisites:* SSC2423 and SSC2413. Fundamental concepts and categories in metaphysics, philosophy of mind or epistemology; the different systems of thought of representative philosophers. Note: May be repeated for credit when topics vary. Lect. 3 hrs. 3 hours credit

**SSC3723 ETHICS**

*Prerequisites:* SSC2413 and SSC2423. Various ethical systems; how ethical philosophy resolves conflicts rationally when automatic responses and implicit rules of action collide with contrary responses and rules. Lect. 3 hrs. 3 hours credit

**SSC3733 AESTHETICS**

*Prerequisites:* SSC2413 and SSC2423. The origins and nature of aesthetic theory; bases of critical judgments in literature, drama, sculpture, architecture and music. Lect. 3 hrs. 3 hours credit

**SSC4133 PROBLEMS IN INTERNATIONAL POLITICS**

*Prerequisites:* SSC2413 and SSC2423. Study of a significant problem area in international relations (e.g., NATO, the special relationship, terrorism), chosen each time of offering for its particular timeliness and relevance. Lect. 3 hrs. 3 hours credit

**SSC4143 CONSTITUTIONAL LAW: INDIVIDUAL RIGHTS**

*Prerequisites:* SSC2413 and SSC2423. Our constitutional rights, including rights of the accused, freedom of speech and press, and freedom of religion. Lect. 3 hrs. 3 hours credit

**SSC4513 SEMINAR IN SOCIAL SCIENCE**

*Prerequisite:* Permission of department chair. Intensive study of a topic determined by the instructor. Assigned readings and class discussion culminating in a major paper written under the instructor's guidance. Lect. 3 hrs. 3 hours credit

**SSC4643 WORLD RELIGIONS**

*Prerequisites:* SSC2413 and SSC2413, or permission of instructor. A study of the major religions of the world: Hinduism, Buddhism, Zoroastrianism, Islam, Judaism, and Christianity. Lect. 3 hrs. 3 hours credit

**SSC4713 THE PHILOSOPHY OF SPACE EXPLORATION**

*Prerequisites:* SSC2413 and SSC2423. A philosophical investigation of the nature and value of space exploration. Standard arguments for and against exploration, the connection between science and technology, the serendipity of science, and the distinction

between fundamental and applied science. Conceptual issues in comparative planetology, space biology, and space physics and astronomy. Philosophical aspects of faster-than-light travel, human vs. machine exploration, space colonies, the likelihood of extra-terrestrial intelligence, and the connection between space technology and war. Lect. 3 hrs. 3 hours credit

**SSC4723 ENLIGHTENMENT AND REVOLUTION**

*Prerequisites:* SSC2413 and SSC2423. Study of the 18th-century Enlightenment and the revolutions that followed in America and France. Lect. 3 hrs. 3 hours credit

**SSC4733 TOPICS IN THE HISTORY AND PROBLEMS OF TECHNOLOGY**

*Prerequisites:* SSC2413 and SSC2423. Investigation of the place of technology in society. Topics vary by semester, but may include the history of technology from ancient to modern times, the development of technology in America and the tension in Western thought between technology and philosophy. Lect. 3 hrs. 3 hours credit

**SSC4743 WORLD WAR I AND WORLD WAR II**

*Prerequisites:* SSC2413 and SSC2423. An investigation of the linkages in political, social, economic, and cultural history at the core of these two events. Cross-national emphases and materials are utilized. The wars as culminations of profound problems, and germinators of succeeding problems. Lect. 3 hrs. 3 hours credit

**SSC4753 THE REFORMATIONS**

*Prerequisites:* SSC2413 and SSC2423. The Protestant Reformation and Catholic Counter-Reformation of the 16th and 17th centuries, focusing on primary texts. Topics include the crisis of the Papacy, the Renaissance-Humanist critique of the Church, the failure of Conciliarism, the splintering of Protestantism and the Catholic revival. Lect. 3 hrs. 3 hours credit

**SSC4763 ORIGINS OF MODERN BRITAIN**

*Prerequisites:* SSC2413 and SSC2423. Introduces the political, social, economic, cultural, and religious history of England in modern times. Emphasis on chronology, how events and ideas unfolded, in each of the five major categories of history. The panorama of seven centuries of intense excitement and change. Lect. 3 hrs. 3 hours credit

**SSC4903 SENIOR THESIS IN SOCIAL SCIENCE**

*Prerequisite:* Permission of department chair. Supervised writing of an essay that demonstrates depth and breadth of understanding of an issue in philosophy, history, economics or some other social science. Students give a public presentation of their Senior Theses. Lect. 3 hrs. 3 hours credit

**SSC4991-3 DIRECTED STUDY IN SOCIAL SCIENCE**

*Prerequisite:* Permission of department chair. Study of a special topic under the direction of a member of the department. 1-3 hours credit

**SSC5991-3 DIRECTED STUDY IN SOCIAL SCIENCE**

*Prerequisite:* Permission of department chair. Study under direction of a member of the department on a special topic, for one to three credits as arranged and authorized by department chair. 1-3 hours credit

**DEPARTMENT OF MATHEMATICS AND  
COMPUTER SCIENCE**

**Professors:**

William C. Arlinghaus  
Ruth G. Favro  
Thomas A. Lackey  
Richard E. Marburger, emeritus  
Roy W. Schenkel, emeritus

**Associate Professors:**

Glen A. Bauer  
David E. Bindschadler,  
(chairperson)  
Chan-Jin Chung  
Sonia Henckel  
Pamela E. Lowry  
Michael J. Merscher  
James D. Nanny

**Assistant Professors:**

Jon Brewster  
Christopher Cartwright  
John Stock, emeritus

**College Professor:**

Ghassan M. Azar

**Senior Lecturer:**

Bashkim Zendeli

**Lecturers:**

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



**CALCULUS SEQUENCE PLACEMENT**

The results of a student's placement assessment in mathematics will determine which course the student will take. The following chart is only a guideline for judging where students might expect to be placed.

High School Background	Expected first semester	Expected second semester
2 units Algebra 1 unit Geometry 0.5 unit Trig.	MCS1414 Calculus 1	MCS1424 Calculus 2
2 units Algebra 1 unit Geometry	MCS0093 Trig.	MCS1414 Calculus 1
1.5 units Algebra 1 unit Geometry	MCS0074 Pre-calc.	MCS1414 Calculus 1
1 unit Algebra 1 unit Geometry	MCS0054 Intermed. Algebra/Geometry	MCS0074 Pre-calc.
1 unit Algebra	MCS0054 Intermed. Algebra/Geometry	MCS0083 College Algebra

**MATHEMATICS AND  
COMPUTER SCIENCE**

**MCS0035 ESSENTIAL  
MATHEMATICS**

*Prerequisite: Placement.*

Operations with whole numbers, decimals, integers, fractions, real numbers, percents, ratios, and exponents. Solving linear equations and inequalities. Slope-intercept form of an equation. Graphing linear equations, Algebra of exponents, polynomials, factoring and rational expressions. Solving systems of two linear equations in two variables, solving quadratic equations. Lect. 5 hrs., Lab. 1 hrs. 5 hours credit

**MCS0044 BASIC ALGEBRA**

*Prerequisite: 0.* Review of whole numbers, decimals, integers, rational and irrational numbers, real numbers. Conversion of units, basic geometry (perimeter area, and volume of prisms and cylinders). Algebra of exponents polynomials, factoring, and rational expressions. Solving linear equations and inequalities. Graphing linear equations. Solving systems of two linear equations in two variables, solving quadratic equations. Lect. 4 hrs. 4 hours credit

**MCS0054 INTERMEDIATE  
ALGEBRA/GEOMETRY**

*Prerequisite: Placement, MCS0044, or MCS0035.*

Fundamental operations, factoring, exponents, radical, linear equations, rectangular coordinates and graphing, systems of linear equations, introduction to quadratic equations, fundamental concepts and formulas of geometry. 5th class hour may be scheduled for exams and study sessions. Lect. 4 hrs. 4 hours credit

**MCS0060 ALGEBRA  
WORKSHOP**

*Prerequisite: Placement or permission of department chair.* This workshop first assesses each student's level of algebraic ability and then introduces the algebraic problems to fit his/her specific needs. Problems are presented using a variety of methods, and the students solve them individually and in group sessions. Upon successful completion of the workshop, students receive a new placement in mathematics. Lab. 4 hrs. 0 hours credit

**MCS0074 PRECALCULUS**

*Prerequisite: Placement, or B+ or better in MCS0054.* Quadratic equations, functions and graphs, systems of equations, theory of equations, inequalities, logarithms, trigonometric definitions, identities, equations. (This course is a faster-paced version of MCS0083 AND MCS0093 combined. 5th class hour may be scheduled for exams and study sessions.) Lect. 4 hrs. 4 hours credit

**MCS0083 COLLEGE ALGEBRA**

*Prerequisite: MCS0054 or placement.* Covers that part of MCS0074 which does not involve trigonometry. Quadratic equations, functions, graphs, systems of equations, theory of equations, inequalities. Successful completion prepares the student for MCS0093 Trigonometry. Lect. 3 hrs. 3 hours credit

**MCS0093 TRIGONOMETRY**

*Prerequisite: MCS0083, or placement.* Covers that part of MCS0074 involving trigonometry and logarithms. Lect. 3 hrs. 3 hours credit

**MCS1003 INTRODUCTION TO COMPUTER APPLICATIONS**

*Prerequisite: 0.* Introduces applications involving use of a computer. Word processing, spreadsheets, data base applications, presentation software. (This course is required of those who do not successfully demonstrate knowledge of these topics upon entry to Lawrence Tech. No credit for mathematics/computer science majors.) Lect. 3 hrs. 3 hours credit

**MCS1023 TECHNICAL COMPUTER APPLICATIONS**

*Prerequisite: 0.* Introduction to computers and computer programming. Spreadsheet software will be utilized for a portion of the course. (For engineering technology students only.) Lect./Lab. 3 hrs. 3 hours credit

**MCS1102 INTRODUCTION TO FORTRAN**

*Prerequisite: Computer placement or MCS1003; co-requisite: MCS0074, MCS0083, MCS0085, MCS1214, or math placement.* Introduction to programming in FORTRAN. Assignment statements, choice of alternatives, arrays, loops, introduction to subroutines. Lect. 2 hrs. 2 hours credit

**MCS1113 TECHNICAL MATHEMATICS 1**

*Prerequisite: Placement, or MCS0044, or MCS0035.* Fundamental operations, functions and graphs, trigonometric functions with right angle applications, systems of linear equations, factoring, fractions, quadratic equations, radian measure, general trigonometric functions. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**MCS1123 TECHNICAL MATHEMATICS 2**

*Prerequisite: MCS1113.* Vectors, oblique triangles, graphs of trigonometric functions, exponents, radicals, logarithms, determinants, matrices. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**MCS1132 TECHNICAL TRIGONOMETRY**

*Prerequisite: MCS0054.* Trigonometric functions with right angle applications, graphs, vectors, oblique triangles, and complex numbers. Exponential and logarithmic functions with graphs and equations. Lect. 2 hrs. 2 hours credit

**MCS1142 INTRODUCTION TO C**

*Prerequisite: Computer placement or MCS1003; co-requisite: MCS0074, MCS0083, MCS0085, MCS1214 or math placement.* Introduction to the C programming language: arrays, functions, file operations, and simple pointer types. Lect. 2 hrs. 2 hours credit

**MCS1203 LOGIC**

*Prerequisite: Placement.* Introduction to deductive and inductive logic. Aristotelian logic, truth functions and truth tables, formal deductions, analysis of fallacies, inductive reasoning. (No credit for mathematics/ computer science majors.) Lect. 3 hrs. 3 hours credit

**MCS1214 INTRODUCTION TO MATHEMATICAL ANALYSIS 1**

*Prerequisite: Placement, or MCS0054.* Equations and inequalities, functions and graphs, lines, parabolas, systems of equations, exponential and logarithmic functions, mathematics of finance, matrix algebra, linear programming. Introduces trigonometry. Lect. 4 hrs. 4 hours credit

**MCS1224 INTRODUCTION TO MATHEMATICAL ANALYSIS 2**

*Prerequisite: Placement, MCS1214, or MCS0083.* Limits and continuity, differentiation, curve sketching, applications of differentiation, integration, methods and applications of integration, multivariable calculus. Lect. 4 hrs. 4 hours credit

**MCS1254 GEOMETRY IN ART**

*Prerequisite: Placement, or MCS0054.* Diverse geometrical applications of mathematical concepts, linking the symbolic representation to the visual representation. Examples from the arts and

architecture; computer applications. Topics may include conic sections, perspective, symmetry, tilings, shading of objects, fractals, trigonometry. Lect. 4 hrs. 4 hours credit

**MCS1414 CALCULUS 1**

*Prerequisite: Placement, MCS0074, or MCS0083 and MCS0093.* Limits and continuity, differentiation of algebraic and trigonometric functions, mean value theorem, applications of differentiation, antiderivatives, indefinite integrals, substitutions, definite integrals, the Fundamental Theorem of Calculus, applications of integration. Lect. 4 hrs. 4 hours credit

**MCS1424 CALCULUS 2**

*Prerequisite: MCS1414.* Calculus of transcendental functions, l'Hospital's rule, techniques of integration, application to arc length and surface area, infinite series. Lect. 4 hrs. 4 hours credit

**MCS1514 COMPUTER SCIENCE 1**

*Prerequisite: MCS1102, MCS1142, MCS1603, MCS1632, MCS1623, or programming experience, and math placement or MCS0054.* Introduction to computer science. Simple, iterative, and conditional statements. Enumerated variable types, procedures and functions, single and multidimensional arrays, bubble sort, linear search, simple file input/output (sequential). Lect. 3 hrs. Lab. 1 hr. 4 hours credit

**MCS1524 INTRODUCTION TO DISCRETE MATHEMATICS**

*Prerequisite: Placement, MCS0083.* Logic and logic operators, proofs; sets and relations, functions; the integers, modular arithmetic, bases; induction and recursion, principles of counting, permutations and combinations, algorithms. Lect. 4 hrs. 4 hours credit

**MCS1603 COBOL**

*Prerequisite: Placement or MCS1003.* Introduction to COBOL programming; the study of the COBOL language and business applications. Sequential, random, and indexed file design and processing, keying schemes, subroutines, and the COBOL library facility. Emphasis on structured programming. Lect. 3 hrs. 3 hours credit

**MCS1623 INTRODUCTION TO VISUAL BASIC**

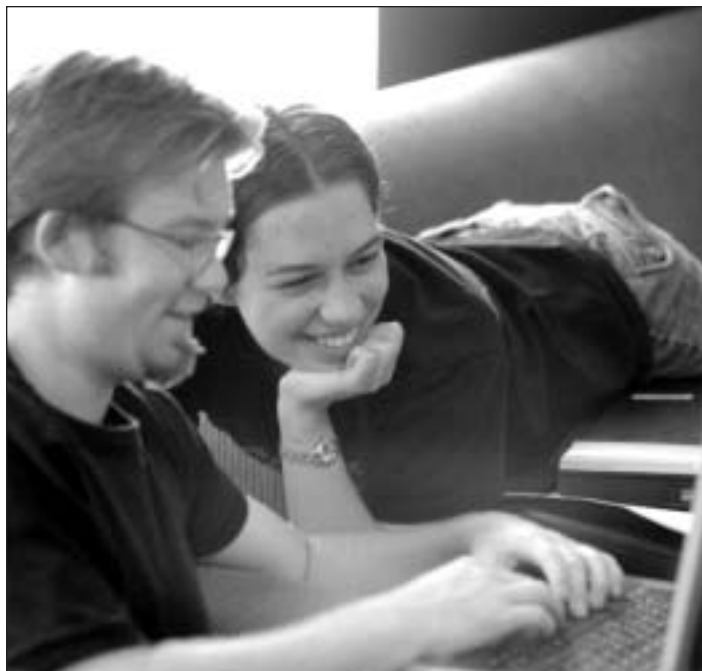
*Prerequisite: Placement or MCS1003.* Visual Basic integrated development environment (IDE) and its wealth of development tools, the use of the debugging and testing tools available in Visual Studio, business applications, design strategy for maintainability and reusability, building effective user interfaces with Visual Basic controls, forms, and other GUI components, Database access. Lect. 3 hrs. 3 hours credit

**MCS1632 INTRODUCTION TO PROGRAMMING**

*Prerequisite: Placement, MCS0083.* Introductory course in programming constructs, conditional statements, loops, branching and subroutines. No previous programming is assumed. (Credit cannot be earned for both this course and any other introductory programming course: MCS1102, MCS1142, MCS1603, MCS1623.) Lect. 2 hrs. 2 hours credit

**MCS2023 STATISTICAL METHODS**

*Prerequisite: MCS1123 or MCS1214.* Introduction to the theory of statistics and some of its applications, use of mathematical models to predict outcomes, data representation, probability, sampling theoretical distributions, estimating, correlation, time series, number usage. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit



**MCS2113 STATISTICS 1**

*Prerequisite: MCS1224 or MCS2313.* Frequency distributions, descriptive measures of populations and samples, probability, discrete and continuous probability distributions, payoff tables, Bayes' theorem, decision theory. Lect. 3 hrs. 3 hours credit

**MCS2123 STATISTICS 2**

*Prerequisite: MCS2113.* The central limit theorem, estimation of means, hypothesis testing, goodness of fit, regression and correlation analysis, statistical computer software. Lect. 3 hrs. 3 hours credit

**MCS2313 TECHNICAL CALCULUS**

*Prerequisite: MCS1123 or MCS1132.* Introduction to plane analytic geometry, basic concepts of calculus, derivatives of simple functions, tangents, curve sketching, indefinite and definite integrals. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**MCS2323 APPLIED DIFFERENTIAL EQUATIONS**

*Prerequisites: MCS1023 and MCS2313.* Introduction to differential equations, differential equations with initial values, numerical methods. The computer is used as a tool throughout the course. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**MCS2414 CALCULUS 3**

*Prerequisite: MCS1424.* Polar coordinates, three-dimensional analytic geometry. Vectors, vector-valued functions, motion in space, functions of several variables, partial differentiation, multiple integrals, integration in vector fields. Lect. 4 hrs. 4 hours credit

**MCS2423 DIFFERENTIAL EQUATIONS**

*Prerequisite: MCS2414.* Ordinary differential equations including principal types of first order equations. Techniques of solution of higher order linear equations with constant coefficients. Applications of first order and higher order equations. Introduction to Laplace transforms. Systems of linear differential equations. Lect. 3 hrs. 3 hours credit

**MCS2514 COMPUTER SCIENCE 2**

*Prerequisite: MCS1514.* Records, advanced file input/output (random access), dynamic memory allocation. Static and dynamic implementation of stacks, linked lists (ordered and unordered), queues (regular and priority), circular queues. Selection and insertion sort, binary search. Lect. 3 hrs., Lab. 1 hr. 4 hours credit

**MCS2523 DISCRETE MATHEMATICS**

*Prerequisites: MCS1514, and either MCS1424 or MCS1524.* Number theory, review of induction and recursion, advanced counting, equivalence, partial ordering, graphs, trees. Lect. 4 hrs. 3 hours credit

**MCS2534 DATA STRUCTURES**

*Prerequisites: MCS2514 and MCS2523.* Analysis of algorithms, Big Oh notation, asymptotic behavior. Advanced sorting (heapsort, quicksort), external sorting. Binary, multiway, and AVL trees. Lect. 4 hrs. 4 hours credit

**MCS2613 C**

*Co-requisite: MCS2514.* Programming using the C language. Emphasis on functions, pointers, arrays, and structures. Bitwise expressions, the pre-processor, storage classes, ragged arrays. Lect. 3 hrs. 3 hours credit

**MCS3403 PROBABILITY AND STATISTICS**

*Prerequisite: MCS2414.* Representation of data, probability, random variables, discrete and continuous distributions, sampling theory, central limit theorem, confidence intervals, tests of statistical hypotheses, regression analysis. Lect. 3 hrs. 3 hours credit



**MCS3413 ADVANCED ENGINEERING MATHEMATICS**

*Prerequisite: MCS2423.* Laplace transforms of continuous and piecewise continuous functions, inverse Laplace transforms, applications to ordinary differential equations. Complex variables, analytic functions, Laurent expansions, residue theory with applications, complex inversion integral and convolution integral. Lect. 3 hrs. *3 hours credit*

**MCS3503 COMPUTER GRAPHICS PROGRAMMING**

*Prerequisite: MCS2534.* Application programming interfaces; interactive computer graphics; two- and three-dimensional representation and transformation; viewing and perspective projections; shading with illumination and material. Lect. 3 hrs. *3 hours credit*

**MCS3513 ASSEMBLER**

*Prerequisite: MCS2514.* Machine and assembly language programming. Addressing modes, macros, and subroutines. Lect. 3 hrs. *3 hours credit*

**MCS3523 MATHEMATICAL MODELING**

*Prerequisites: MCS1142, MCS1514 or EGE101/1201/1301; MCS2414 plus at least one of MCS3403, MCS2423, or MCS3863, or permission of instructor.* Building and analyzing mathematical and computer models of various systems. Optimization, dynamical systems, and probability models. Team projects, written and oral reports. Lect. 3 hrs. *3 hours credit*

**MCS3543 INTRODUCTION TO DATABASE SYSTEMS**

*Prerequisite: MCS1514.* Organization of database systems. Data definition, retrieval, manipulation. Relational data bases, SQL. Practice using standard databases. Lect. 3 hrs. *3 hours credit*

**MCS3603 JAVA**

*Prerequisite: MCS1514.* Introduction to Java; comparing Java to C++, Java building elements: control structures, methods, object-oriented programming, arrays and strings, inheritance, graphics programming, applets, multithreading and multimedia. Lect. 3 hrs. *3 hours credit*

**MCS3613 C++**

*Prerequisite: MCS1142.* Object-oriented programming techniques introduced through the language C++. Lect. 3 hrs. *3 hours credit*

**MCS3623 UNIX SYSTEM OPERATION AND PROGRAMMING**

*Prerequisite: MCS1514.* Unix standardization and implementations, files and directories, standard I/O library, system data files and implementations, process control, process relationship, signals, advanced I/O. Daemon processes, inter-process communication. Lect. 3 hrs. *3 hours credit*

**MCS3633 INTRODUCTION TO FUNCTIONAL PROGRAMMING**

*Prerequisite: MCS1514.* An introduction to functional programming. Induction and recursion, symbolic computation, higher-order functions, polymorphism, data abstraction and modularity, invariants, demand-driven programming, exception handling, and computability. Lect. 3 hrs. *3 hours credit*

**MCS3653 COMPUTER ARCHITECTURE**

*Prerequisite: MCS3513.* Detailed study of the organization and structure of modern computer systems. Lect. 3 hrs. *3 hours credit*

**MCS3663 COMPUTER ARCHITECTURE AND ASSEMBLY PROGRAMMING**

*Prerequisite: MCS2514.* Basic structure of computer hardware and assembly programming. Internal representations, processing unit arithmetic, memory addressing modes, stack processing, CISC, RISC. Lect. 3 hrs. *3 hours credit*

**MCS3673 NETWORK SYSTEM ADMINISTRATION**

*Prerequisite: MCS1514.* Introduction to network systems, daemons, booting the system, policy, NFS, NIS, serial lines, disks, kernel configurations, Internet, USEnet, www, FTP, electronic mail, resource management, performance analysis, accounting, system logging, security, backups, hackers and padlocks. Lect. 3 hrs. *3 hours credit*

**MCS3723 ADVANCED CALCULUS**

*Prerequisite: MCS2423.* Line and surface integrals, Green's Theorem, Stokes' Theorem, Divergence Theorem. Topics from differential and integral calculus theory. Power series solutions of differential equations. Bessel functions, Legendre's equation. Lect. 3 hrs. *3 hours credit*

**MCS3733 PARTIAL DIFFERENTIAL EQUATIONS**

*Prerequisite: MCS2423.* Orthogonality, orthonormal bases, Fourier series, Fourier integral. Solution techniques for first and second order equations. Solutions of homogeneous and non-homogeneous boundary value problems. Sturm-Liouville theory. Lect. 3 hrs. *3 hours credit*

**MCS3743 COMPLEX ANALYSIS**

*Prerequisite: MCS2423.* Complex numbers. DeMoivre's Theorem. Complex variables, analytic functions, Cauchy-Riemann equations, Laurent expansions, contour integration, residue theory. Lect. 3 hrs. *3 hours credit*

**MCS3863 LINEAR ALGEBRA**

*Prerequisite: MCS2414.* Systems of linear equations, matrices, determinants, eigenvalues, eigenvectors. Finite-dimensional vector spaces, linear transformations and their matrices, Gram-Schmidt orthogonalization, inner product spaces. Lect. 3 hrs. *3 hours credit*

**MCS4613 COMPUTER NETWORKS**

*Prerequisite: MCS3663.* Transmission media, local asynchronous communication (RS232), long distance communication, packets, frames, error detection, LAN technologies, network topologies, hardware addressing, LAN wiring, physical topologies, interface hardware, extending LANs, fiber modems, repeaters, bridges and switches, WAN topologies and routing. Lect. 3 hrs. *3 hours credit*

**MCS4623 INTRODUCTION TO SOFTWARE ENGINEERING**

*Prerequisite: MCS2514.* Introduction to software engineering emphasizing technical concepts, team management, and product performance. Analysis, design, implementation, verification, validation, and maintenance of software. Lect. 3 hrs. *3 hours credit*

**MCS4633 ARTIFICIAL INTELLIGENCE**

*Prerequisite: MCS2534.* Introduction to artificial intelligence. Knowledge representation and acquisition, decision trees, logic programming, non-deterministic and non-algorithmic problem solving, forward and backward chaining, symbol processing, predicate logic. Expert systems. Lect. 3 hrs. *3 hours credit*

**MCS4643 COMPARATIVE PROGRAMMING LANGUAGES**

*Prerequisite: MCS2534.* A survey of different types of programming languages done by comparing and contrasting the underlying concepts of their design and use. Information hiding, data abstraction, modularity. Lect. 3 hrs. 3 hours credit

**MCS4653 THEORY OF COMPUTATION**

*Prerequisite: MCS2523.* Beginning course on theory of computation. Regular languages, finite automata, context-free languages, Turing Machine, Chomsky hierarchy, applications to parsing. Lect. 3 hrs. 3 hours credit

**MCS4663 OPERATING SYSTEMS**

*Prerequisite: MCS3653 or MCS3663.* Principles of operating systems. Storage management, interrupts, paging, swapping, protection, file management. Lect. 3 hrs. 3 hours credit

**MCS4813 NUMERICAL ANALYSIS 1**

*Prerequisite: MCS1102 or MCS1142.* Approximation and error. Roots of equations, approximation of algebraic and transcendental functions, differentiation, indefinite and definite integration. Quadrature, interpolation. Lect. 3 hrs. 3 hours credit

**MCS4823 NUMERICAL ANALYSIS 2**

*Prerequisite: MCS4813.* Numerical techniques for the solution of ordinary differential equations, matrix exponential computations, matrix inversion. Selected topics. Lect. 3 hrs. 3 hours credit

**MCS4833 SENIOR PROJECT**

*Prerequisite: Permission of department chair.* Intensive study of special problems in software system development. Students participate in specifying, designing, developing, coding, and testing of complex software systems. Emphasis on team development of projects. Lect. 3 hrs. 3 hours credit

**MCS4863 MODERN ALGEBRA**

*Prerequisite: MCS3863.* Introduction to algebraic systems. Groups, homomorphisms, isomorphisms, subgroups, normal subgroups, factor groups. Rings and ideals, integral domains, fields. The real number system. Lect. 3 hrs. 3 hours credit

**MCS4993 TOPICS IN MATH/COMPUTER SCIENCE**

*Prerequisite: Permission of department chair.* Topics of current interest in mathematics and computer science. (May be taken more than once if the topic is different.) Lect. 3 hrs. 3 hours credit

**MCS5003 ESSENTIALS OF COMPUTER SCIENCE**

*Prerequisite: Permission of department chair and approximately five years of professional software development.* Concepts of computer science for the experienced software developer. Topics from MCS1514, MCS2514, MCS2523, MCS2534, and MCS3663 are highlighted. Lect. 3 hrs. 3 hours credit

**MCS5013 WEB SERVER PROGRAMMING**

*Prerequisite: Permission of department chair.* Introduction to the Web-server basis; Web authoring using HTML; Advanced Web authoring with dynamic HTML, XML; JavaScript programming; CGI programming in C, C++ and Perl. Introduction to ASP and the middle tier. Lect. 3 hrs. 3 hours credit

**MCS5023 JAVA PROGRAMMING**

*Prerequisite: Permission of department chair.* An advanced course in Java programming. Advanced multi-threading, multimedia and graphics. Networking and RMI. Database access with Java. Java Beans and EJB.

Servlets and JSP. Multi-tier application development using CORBA. Java and embedded systems. JINI. Current topics in Java technology. Lect. 3 hrs. 3 hours credit

**MCS5033 OBJECT COMPUTING**

*Prerequisite: Permission of department chair.* Introduction to the fundamental concepts of building reusable software components and applications using COM and DCOM architecture. Programming with COM. Building and using ActiveX controls. Using MFC to build COM clients and servers. Using automation. Using ATL to create COM clients and servers. Programming with DCOM. Introduction to CORBA. Lect. 3 hrs. 3 hours credit

**MCS5043 PROGRAMMING LANGUAGE IMPLEMENTATION**

*Prerequisite: Permission of department chair.* Substantial programming experience is required. Issues associated with the design and implementation of higher-level programming languages. Concentrations are theory behind different components of a compiler, programming techniques used to put the theory into practice, and the interfaces used to modularize the compiler. Course project on compiler design and implementation. Lect. 3 hrs. 3 hours credit

**MCS5053 COMPUTABILITY**

*Prerequisite: Permission of department chair.* The second course on theory of computation. Introduces decidability, computability, and computational complexity. Church's Thesis; undecidability; reducibility and completeness; recursive functions; time complexity and NP-completeness. Lect. 3 hrs. 3 hours credit



**MCS5083 VISUAL PROGRAMMING**

*Prerequisite: Permission of department chair.* Introduction to Windows programming. Principles of human-computer interaction. Graphical user interface programming. Event driven programming. Developing help systems. Evaluation techniques. Windows programming environments such as MFC and UNIX. Introduction to various RAD tools. Lect. 3 hrs. *3 hours credit*

**MCS5103 SOFTWARE ENGINEERING**

*Prerequisite: Permission of department chair.* Selection of programming language; debugging techniques and tools; program maintenance; software economics; team programming and its application to projects; software life cycle. Lect. 3 hrs. *3 hours credit*

**MCS5203 INTRODUCTION TO COMPUTER GRAPHICS**

*Prerequisite: Permission of department chair.* Introduction to fundamental computer graphics issues, hardware, algorithms, and software. Scan-conversion line generators; scan-line polygon; affine transformation; viewing and clipping; illumination and rendering; solid modeling; curves and surfaces; texture mapping; collision detection; animation; issues of virtual environments applications. Lect. 3 hrs. *3 hours credit*

**MCS5213 COMPUTATIONAL GEOMETRY**

*Prerequisite: Permission of department chair.* Implicit and explicit representations of curves in the plane; vectors and transformations; curves and surfaces in space. Splines and other representations. Computational issues in intersection, minimum distance, edge detection and projection algorithms. Lect. 3 hrs. *3 hours credit*

**MCS5223 COMPUTER AIDED GEOMETRIC DESIGN**

*Prerequisite: Permission of department chair.* Bezier and NURBS representations of curves and surfaces. Properties of B-Splines and resulting algorithms. Designing curves and surfaces. Issues surrounding topology, trimmed surfaces and triangulation. Other representations. Lect. 3 hrs. *3 hours credit*

**MCS5303 INTRODUCTION TO DATABASE SYSTEMS**

*Prerequisite: Permission of department chair.* Design and implementation of relational, hierarchical and network database systems. Query/update data languages, conceptual data model, physical storage methods, database system architecture and normal forms. Database security and integrity. Relational database systems are emphasized. A project involving an on-line database system is normally assigned. No credit given after MIS6113. Lect. 3 hrs. *3 hours credit*

**MCS5403 ROBOTICS PROGRAMMING**

*Prerequisite: Permission of department chair.* Characteristics of real-time computing. Introduction to robotics, control theories, modeling finite state machines, design methodologies for real-time systems, process synchronization using semaphores, Lego robots and developing robot programs using various programming languages and different real-time operating systems for autonomous mobile robots such as Khepera and Lego RIS. Lect. 3 hrs. *3 hours credit*

**MCS5503 INTELLIGENT SYSTEMS**

*Prerequisite: Permission of department chair.* Introduction to artificial intelligence and computational intelligence. Problem solving by searching. Optimization methods. Knowledge representa-



tion and reasoning. Machine learning. Multi-agent systems. Pattern recognition. Introduction to evolutionary computation. Introduction to artificial neural networks. Fuzzy logic. Lect. 3 hrs. *3 hours credit*

**MCS5523 VIRTUAL ENVIRONMENT AND SCIENTIFIC VISUALIZATION**

*Prerequisite: Permission of department chair and technical proficiency in one of: architecture design, programming, modeling, or painting.* A project based hands-on course. Teams with members of varied backgrounds build immersive virtual worlds to solve real world scientific visualizations problems. Lect. 3 hrs. *3 hours credit*

**MCS5703 INTRODUCTION TO DISTRIBUTED COMPUTING**

*Prerequisite: Permission of department chair.* Introduction to data communications, network models, topologies and structures. Includes the OSI model, transport mediums (routers, bridges, gateways), and an overview of communication protocols, particularly TCP/IP. Lect 3 hrs. *3 hours credit*

**COOPERATIVE EDUCATION IN MATH/COMPUTER SCIENCE**

**MCS3001 CO-OP PRACTICUM I**

*Prerequisite: Junior standing (60 credit hours), 2.25 LTU GPA, completion of all freshman and sophomore course requirements, departmental approval.* First full-time work assignment providing computer science experience in the workplace. *1 hour credit*

**MCS3101 CO-OP PRACTICUM II**

*Prerequisite: Satisfactory completion of MCS3001, departmental approval.* Second full-time work assignment providing computer science experience in the workplace. *1 hour credit*

**MCS4001 CO-OP PRACTICUM III**

*Prerequisite: Satisfactory completion of MCS3101, departmental approval.* Third full-time work assignment providing computer science experience in the workplace. *1 hour credit*



**DEPARTMENT OF NATURAL SCIENCES**

**Professors:**

Charles M. Chambers  
 Jerry L. Crist  
 Walter K. Dean  
 Richard E. Marburger, emeritus  
 Richard E. Michel, emeritus  
 Daniel W. Mioduszewski  
 Hsiao-Ping H. Moore  
 Anthony F. Sky  
 Maria J. Vaz

**Associate Professors:**

William G. Madden  
 (chairperson)  
 Marilyn V. Rands  
 Scott D. Schneider

**Assistant Professor:**

Valentina Tobos

**Senior Lecturers:**

Lavetta Appleby  
 S. Alex Moosavi

**Lecturers:**

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



**BIOLOGY**

**BIO1213 BIOLOGY 1**

*Prerequisite: One high school science course.* The basic structure, chemistry and energetics of a cell. Mechanisms of inheritance, gene structure and function, and Mendelian genetics. Origin and history of life, mechanisms of evolution, and introduction to systematics. Lect. 3 hrs. 3 hours credit

**BIO1221 BIOLOGY 1 LABORATORY**

*Prerequisite: One high school science lab. Co-requisite: BIO1213.* Experiments to support BIO1213, including the use of the microscope. Lab. 2 hrs. 1 hour credit

**BIO1223 BIOLOGY 2**

*Prerequisite: One high school science course.* The biology, structure, physiology, development and reproduction of plants. Animal

anatomy and physiology, including nervous systems, gas exchange, excretion, the circulatory system, and reproduction. An introduction to animal behavior and the impact of pollution. Survey of ecology, biogeography, and population biology. Conservation biology. Lect. 3 hrs. 3 hours credit

**Note:** *BIO1213 and BIO1223 are independent courses and may be taken in either order.*

**BIO1231 BIOLOGY 2 LABORATORY**

*Prerequisite: One high school science lab. Co-requisite: BIO1223.* Experiments to support BIO1223. Lab. 2 hrs. 1 hour credit

**BIO2313 MICROBIOLOGY**

*Prerequisite: BIO1213.* Function and structure of micro-organisms including bacteria, algae, protozoa and viruses, including how they interact with their environment including higher organisms; ecology of micro-organisms; their beneficial and harmful effects. Lect. 3 hrs. 3 hours credit

**BIO2321 MICROBIOLOGY LABORATORY**

*Prerequisite: BIO1221. Co-requisite: BIO2313.* Experiments that support BIO2313 including basic and practical techniques of handling micro-organisms and of illustrating various principles of microbial life. Lab. 2 hrs. 1 hour credit

**BIO2323 MOLECULAR GENETICS**

*Prerequisites: BIO1223, CHM1213.* Basic genetic materials and their function, differentiation and development; genetic proteins; gene regulation; macromolecules and chromosomes, extranuclear material - episomes and plasmids; cell division; Mendelian inheritance; gene expression including dominance and codominance, gene interaction and lethality, sex determination and linkage, inheritance; gene linkage and recombination; mechanisms including repair of mutations, changes in chromosome structure and fine structure of genes. Lect. 3 hrs. 3 hours credit

**CHEMISTRY**

**CHM1154 INTRODUCTION TO CHEMICAL PRINCIPLES**

*Prerequisite: Placement. Co-requisite: MCS0054, MCS0055, or math placement.* (An introductory course for students who have not had high school chemistry or who need preparation before taking CHM1213. No degree credit in engineering, sciences, or architecture.) Fundamentals of chemical terminology, stoichiometry calculations, atomic structure, chemical

bonding, gases, solution chemistry, and the chemistry of metals and nonmetals. May only receive degree credit for one of the following courses: CHM1154 and PSC1113. Lect. 3 hrs., Lab/Sem. 2 hrs. 4 hours credit

**CHM1213 UNIVERSITY CHEMISTRY 1**

*Prerequisites: 1 yr. high school chemistry and chemistry placement, or CHM1154 or CHM3144; MCS0083, MCS1214, or math placement, or co-requisite of MCS0074.* Laws and concepts of chemistry and their application to chemical systems. The liquid and solid states, phase changes and phase diagrams, topics in the chemistry of materials, oxidation-reduction chemistry, electrochemistry, chemical thermodynamics and gas-phase equilibrium. Lect. 3 hrs., Sem. 1 hr., 3 hours credit

**CHM1221 UNIVERSITY CHEMISTRY 1 LABORATORY**

*Co-requisite: CHM1213.* Laboratory experiments supporting topics covered in CHM1213. Lab. 3 hrs. biweekly. 1 hour credit

**CHM1223 UNIVERSITY CHEMISTRY 2**

*Prerequisites: CHM1213, CHM1221.* Modern concepts of chemical bonding, symmetry, molecular-orbital theory and spectroscopic methods. The solution state and colligative properties of solutions, and solution-phase equilibrium theory applied to solubility, chemical kinetics, acids and bases, and complex formation. Descriptive chemistry of the main-group and transition elements. Lect. 3 hrs. 3 hours credit

**CHM1232 UNIVERSITY CHEMISTRY 2 LABORATORY**

*Co-requisite: CHM1223.* Laboratory experiments supporting topics covered in CHM1223, including qualitative analysis of cations. Lab. 6 hrs. 2 hours credit



**CHM2313 ORGANIC CHEMISTRY 1**

*Prerequisites:* CHM1213, CHM1221. Fundamental concepts and definitions embodying a mechanistic approach to the reactions of aliphatic and aromatic compounds. Lect. 3 hrs. 3 hours credit

**CHM2323 ORGANIC CHEMISTRY 2**

*Prerequisite:* CHM2313. Mechanisms with emphasis on functional groups, spectroscopic methods and structural proofs; selected topics with special emphasis on instrumental approaches to organic problems, organic compounds of biochemical significance. Lect. 3 hrs. 3 hours credit

**CHM2332 ORGANIC CHEMISTRY LABORATORY**

*Prerequisite:* CHM2313. *Co-requisite:* CHM2323. Fundamental micro and macroscale laboratory techniques and syntheses, utilizing gas chromatographic and spectroscopic techniques together with qualitative organic analysis. Lab 6 hrs. 2 hours credit

**CHM2342 ANALYTICAL CHEMISTRY**

*Prerequisites:* CHM1223, CHM1232. Extensive use of computers including spreadsheet and word processing programs. Theory of gravimetric, volumetric, and electroanalytical methods. Theory of separation science and chromatography. Statistical analysis of analytical data. Lect. 2 hrs. 2 hours credit

**CHM2352 ANALYTICAL CHEMISTRY LABORATORY**

*Co-requisite:* CHM2342. Extensive use of computers, particularly spreadsheet programs. Practice of gravimetric, volumetric, spectrophotometric, chromatographic, and electrometric methods of quantitative chemical analysis. Lab. 6 hrs. 2 hours credit

**CHM2631 INSTRUMENTAL LAB**

*Prerequisites:* CHM2342, CHM2352. Laboratory course for chemical technology majors with experiments involving chemical analysis by atomic absorption, X-ray analysis, gas and liquid chromatography, and voltammetry. (Note: CHM2631 is intended for chemical technology majors. Bachelor's degree students in chemistry and environmental chemistry should take CHM4632.) Lab. 3 hrs. 1 hour credit

**CHM3144 FUNDAMENTALS OF CHEMISTRY**

*Prerequisite:* Advanced standing. Introduction to chemistry, covering the periodic table, atomic structure, chemical bonding, stoichiometry, solids, liquids, gases, solutions and basic organic chemistry. (For advanced students in engineering technology only. CHM1154 may substitute for CHM3144 with permission of the department chair.) Lect. 3 hrs, Lab. 1 hr. 4 hours credit

**CHM3383 ENVIRONMENTAL CHEMISTRY**

*Prerequisites:* CHM2323, CHM2342, CHM2352. Survey of environmental problems and how they impact upon the chemist. The chemistry of the atmosphere, natural waters, the soil and waste management. Lect. 3 hrs. 3 hours credit

**CHM3403 BIOCHEMISTRY**

*Prerequisites:* CHM2323, CHM2332. Chemistry of biologically important molecules, including carbohydrates, lipids, proteins, and nucleic acids. Bioenergetics, the genetic code, and enzyme catalysis. Lect. 3 hrs. 3 hours credit

**CHM3423 PHYSICAL CHEMISTRY 1**

*Prerequisites:* MSC2414, CHM1223, CHM2313, CHM2323. The First and Second Laws of Thermo-dynamics, with applications to phase transformations and

chemical reactions. Introduction to quantum theory. Lect. 3 hrs. 3 hours credit

**CHM3431 PHYSICAL CHEMISTRY 1 LAB**

*Co-requisite:* CHM3423. Laboratory experiments supporting topics covered in CHM3423. Lab. 3 hrs. 1 hour credit

**CHM3434 PHYSICAL CHEMISTRY 2**

*Prerequisites:* MCS2414, CHM1223, CHM2313, PHY2423. Atomic and molecular structure and spectra. Statistical Thermodynamics. Kinetic theory of gases and chemical kinetics. Lect. 4 hrs. 4 hours credit

**Note:** CHM3423 and CHM3434 are independent courses and can be taken in either order.

**CHM3441 PHYSICAL CHEMISTRY LAB 2**

*Co-requisite:* CHM3434. Laboratory experiments supporting topics covered in CHM3434. Lab. 3 hrs. 1 hour credit

**CHM3442 PHYSICAL-ANALYTICAL LABORATORY 1**

*Prerequisite:* CHM2352. *Co-requisites:* CHM3423 and CHM3434. Laboratory experiments supporting topics covered in CHM3423 and CHM3434. Equivalent to CHM3431 and CHM3441 combined. Lab. 6 hrs. 2 hours credit

**CHM3452 INTERMEDIATE INORGANIC CHEMISTRY**

*Prerequisite:* CHM1223. Structures, properties, and reactions of compounds of the main-group and transition elements. Solid-state structures and bonding. Crystal-field theory applied to the description of the magnetic and spectroscopic properties of metal complexes. Lect. 2 hrs. 2 hours credit

**CHM3463 ADVANCED SYNTHESIS LABORATORY**

*Prerequisites:* CHM2323, CHM2332, CHM2342. Preparation and characterization of inorganic, organic, and organometallic compounds using advanced laboratory techniques. Lect. 1 hr. Lab. 6 hrs. 3 hours credit

**CHM3503 COMPUTER APPLICATIONS IN CHEMISTRY**

*Prerequisite:* MCS1142 or permission of instructor. Application of computers and computer programming to the solution of chemical problems and to instrument control in the laboratory. Lect. 1 hr. Lab. 6 hrs. 3 hours credit

**CHM3592 ENVIRONMENTAL CHEMISTRY 2**

*Prerequisite:* CHM3383. Topics include federal and state regulations, EPA methodologies, analytical methods of analysis, environmental sampling procedures, quality control and quality assurance. Basic physical and chemical environmental parameters such as turbidity, conductivity, pH, hardness, dissolved oxygen, BOD, COD, and TOC will be discussed. Goal is a working-level knowledge of environmental monitoring techniques and field data collection related to environmental compliance. Lect. 2 hrs. 2 hours credit

**CHM3601 SEMINAR IN CHEMICAL TOPICS**

*Prerequisite:* Junior standing in chemistry and permission of department chair. The presentation of a paper on an approved topic, or a seminar on a specialized topic. 1 hour credit

**CHM3623 POLYMER CHEMISTRY**

*Prerequisite:* CHM2313. Introduction to the principles of high molecular weight materials, the kinetics of their synthesis, characterization, manufacture, and structure-property relationships. Lect. 3 hrs. 3 hours credit

**CHM4522 ADVANCED SPECTROSCOPY**

*Prerequisites:* CHM3434, CHM3442. Topics in advanced UV-VIS and IR spectroscopy, NMR, ESR, and mass spectroscopy. Symmetry with applications to spectroscopy. Lect. 2 hrs. 2 hours credit

**CHM4542 PHYSICAL-ANALYTICAL LABORATORY 2**

*Co-requisite:* CHM4522. Laboratory experiments supporting topics covered in CHM4522. Lab. 6 hrs. 2 hours credit

**CHM4631 INSTRUMENTAL ANALYSIS**

*Prerequisites:* CHM2631, CHM3434. Primarily the lecture portion of CHM4632; intended for those who took CHM2631 as chemical technology majors. CHM2631 together with this course is equivalent to CHM4632. Lect. 1 hr. 1 hour credit

**CHM4632 INSTRUMENTAL ANALYSIS LABORATORY**

*Prerequisite:* CHM3434. Laboratory problems involving chemical analysis by atomic absorption, X-ray analysis, gas and liquid chromatography, and voltammetry. Lect. 1 hr. Lab. 3 hrs. 2 hours credit

**CHM4643 ADVANCED INORGANIC CHEMISTRY**

*Prerequisites:* CHM3452, CHM3434. Advanced topics in theoretical and descriptive inorganic and organometallic chemistry. Kinetics and mechanisms of inorganic reactions. Symmetry and molecular orbital theory applied to the structural and spectroscopic properties of inorganic compounds. Lect. 3 hrs. 3 hours credit

**CHM4723 ADVANCED ORGANIC CHEMISTRY**

*Prerequisite:* CHM2323. Kinetics and mechanism in organic chemistry. Lect. 3 hrs. 3 hours credit

**CHM4843 SOLID STATE CHEMISTRY**

*Prerequisite:* CHM3434 or PHY3653. Brief review of atomic theory, crystal structure, binding forces, mechanical and thermal properties, electrical and magnetic properties of dielectrics, metals, semiconductor and magnetic materials. Lect. 3 hrs. 3 hours credit

**CHM4912 ENVIRONMENTAL CHEMISTRY PROJECT 1**

*Prerequisite:* Senior standing. Initiation of a senior project in environmental chemistry, typically involving a field study and/or computer simulation. Students select and work with a faculty advisor on the project. Subject matter requires prior approval. Lect. 2 hrs. 2 hours credit

**CHM4922 ENVIRONMENTAL CHEMISTRY PROJECT 2**

*Prerequisite:* CHM4912. Completion of the senior project in environmental chemistry. Requires a formal written report, an oral presentation, and complete documentation of the study. Lect. 2 hrs. 2 hours credit

**CHM4941-3 INDEPENDENT STUDY IN CHEMISTRY**

*Prerequisite:* Permission of department chair. Research or special studies under the direction of a staff member. 1, 2 or 3 hours credit, 4 hours maximum.

**CHM4951-3 INTERNSHIP IN CHEMISTRY**

*Prerequisite:* Permission of the department chair. Internship work experience in chemistry at a laboratory or industrial placement. A minimum of 5 hours/week (on average) for each credit hour for the 15 week semester. A final report including a log documenting the work done, plus a written assessment from the employer is required for class credit. 1, 2 or 3 hours credit.

**GEOLOGY**

**GLG1103 GEOLOGY**

*Prerequisite:* 0. Minerals; igneous, sedimentary and metamorphic rock formations and processes. Glaciation, ground water, water resources, mass wasting and volcanology. Case studies of practical geology problems. Lect. 3 hrs. 3 hours credit

**PHYSICAL SCIENCE**

**PSC1113 PHYSICAL SCIENCE 1**

*Prerequisite:* 0. Atomic structure emphasizing Bohr's Theory and current views on elementary particles. Nuclear reactions. Fundamental concepts in chemistry. Organic chemistry and its applications. Environmental and ecological concerns. Topics of geology, the atmosphere and weather. Lect. 3 hrs. 3 hours credit

**Note:** May only receive degree credit for one of the following courses: CHM1154 or PSC1113. No credit for PSC1113 after taking CHM1213 (University Chemistry).

**PSC1123 PHYSICAL SCIENCE 2**

*Co-requisite:* MCS1214. An algebra-based introduction to the basic principles of science, particle motion, wave motion, heat and astronomy. Lect. 3 hrs. 3 hours credit

**Note:** May only receive degree credit for one of the following courses: PHY1154 or PSC1123. No credit for PSC1123 after College Physics or University Physics.

**PSC1131 PHYSICAL SCIENCE LAB**

*Prerequisite:* One college science course. Experiments in physics, chemistry, astronomy and earth sciences. Lab. 2 hrs. 1 hour credit

**PSC1161 PHYSICAL SCIENCE SEMINAR**

*Prerequisite:* Physics or chemistry major or approval of the department chair. Portfolio development, group collaborative projects, discussions, written and oral presentations of current topics in physical science, particularly chemistry and physics. Lect. 1 hr. 1 hour credit

**PHYSICS**

**PHY0023 BASIC PHYSICS**

*Prerequisite:* 0. Density, force, pressure, work formula, simple machines, energy, power, metric units, friction, vectors, Newton's Laws, and d-c circuits. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**PHY1063 TECHNICAL PHYSICS I**

*Prerequisite:* One year of high school lab science or PHY0023. *Co-requisite:* MCS1113. Systems of measurement, velocities, acceleration, laws of motion, composition and resolution of forces, work, power, energy and machines, mechanics of solids and liquids. (For engineering technology students only.) Lect. 3 hrs. 3 hours credit

**PHY1083 TECHNICAL PHYSICS II**

*Prerequisite:* PHY1063. *Co-requisite:* MCS1123. Temperature, heat transfer, change of state, magnetic and electric fields, electrical units and current electricity with its magnetic and heating effects, alternating current, light reflection, refraction and physical optics. Lect. 3 hrs., Lab. 1 hr. 3 hours credit

**PHY1100 TECHNICAL PHYSICS LAB 1**

*Co-requisite:* PHY1063. Introductory lab covering experiments in mechanics, heat, electricity and magnetism and light. Lab. 1 hr. 0 hours credit

**Note:** *PHY1100 is the first part of a lab that runs for two semesters. A grade will be only issued after taking PHY1101 (see below).*

### **PHY1101 TECHNICAL PHYSICS LAB 2**

*Prerequisite: PHY1100. Co-requisite: PHY1063.* Second semester of the lab which runs for two semesters. The grade for the lab is given at the end of this course. Lab. 1 hr. *1 hour credit*

### **PHY1154 INTRODUCTION TO PHYSICAL PRINCIPLES**

*Prerequisite: MCS0093 or MCS0074 or math placement; experience with computers.* (For students who have not had high school physics or need additional preparation before PHY2213 or PHY2414.) Introduction to mechanics, heat, sound, light, electricity and magnetism. May not be used to satisfy graduation requirements for degrees in architecture, chemistry, engineering, mathematics or physics. Satisfies general education science lab requirement. May only receive degree credit for one of the following courses: PHY1154 or PSC1123. Integrated Lab. & Lect. 4 hrs. *4 hours credit*

### **PHY1161 PHYSICS SEMINAR**

*Prerequisite: 0.* Discussions, written and oral presentations of current topics in Physics. Lect. 1 hr. *1 hour credit*

### **PHY1173 RADIATION AND ENVIRONMENTAL PHYSICS**

*Prerequisites: High school chemistry or CHM1154; high school physics; and MCS0054 or equivalent.* Study of environmental effects of hazardous materials. The techniques of radioisotope quantification, radioactive decay processes, disposal and its biological hazards. Environmental impact of thermal pollution, chemicals, ionizing radiation and physical hazards. Specific regulations that govern radioactive materials are covered. Lect. 3 hrs. *3 hours credit*

### **PHY1181 RADIATION AND ENVIRONMENTAL PHYSICS LAB**

*Co-requisite: PHY1173.* Primarily experimental techniques in detecting and quantifying radiation and the identification of radioisotopes present in samples of materials. Lab. 2 hrs. biweekly. *1 hour credit*

### **PHY1213 INTRODUCTORY ASTRONOMY**

*Co-requisite: MCS0054, MCS0055 or placement.* A survey of contemporary knowledge of the nature and the evolution of planets, stars, galaxies and the universe. Topics include stellar evolution, the origin of the elements, the death of stars, black holes, the structure of the Milky Way galaxy, other galaxies, dark matter, the expanding universe and the big bang. Lect. 3 hrs. *3 hours credit*

### **PHY1221 INTRODUCTORY ASTRONOMY LABORATORY**

*Co-requisite: PHY1213.* A companion laboratory experience to support PHY1213. Experiments include hands-on and online activities and astronomy software explorations of seasons, phases of the moon, eclipses, solar system formations, stellar evolution, black holes, and Hubble's Law. Lab. 2 hrs. *1 hour credit*

### **PHY2213 COLLEGE PHYSICS 1**

*Prerequisites: MCS0074, or MCS0093, or MCS1254, or math placement; PHY1154 or physics placement.* Kinematics and dynamics of particles, work, energy, bodies in equilibrium, wave motion, elasticity, heat transfer, thermal energy and thermodynamics. Lect. 3 hrs. *3 hours credit*

### **PHY2221 COLLEGE PHYSICS 1 LABORATORY**

*Prerequisites: MCS1003 or equivalent computer experience.* Co-requisite: PHY2213. Introductory laboratory covering experiments to complement College Physics 1. Lab. 2 hrs. *1 hour credit*

### **PHY2223 COLLEGE PHYSICS 2**

*Prerequisites: MCS1224 or MCS1254; PHY2213.* Geometric optics, electric charge, current, DC circuits, magnetism, induction, special relativity, particle waves, radioactivity and biological effects of radiation. Lect. 3 hrs. *3 hours credit*

### **PHY2231 COLLEGE PHYSICS 2 LABORATORY**

*Prerequisites: PHY2213, PHY2221.* Co-requisite: PHY2223. Introductory lab covering experiments compatible with College Physics 2. Lab. 2 hrs. *1 hour credit*

### **PHY2413 UNIVERSITY PHYSICS 1**

*Prerequisites: MCS1414; PHY1154 or physics placement.* Co-requisites: MCS1424. Kinematics and dynamics of particles, conservation of energy, relativistic mechanics, statics and dynamics of rigid bodies. Mechanics of fluids, temperature, heat and thermal energy; laws of thermodynamics; wave motion and sound. Lect. 3 hrs., Studio 1 hr. *3 hours credit*

### **PHY2421 UNIVERSITY PHYSICS 1 LAB**

*Prerequisite: MCS1003 or equivalent computer experience.* Co-requisite: PHY2413. Introductory laboratory experiments to complement University Physics 1. Lab. 2 hrs. *1 hour credit*

### **PHY2423 UNIVERSITY PHYSICS 2**

*Prerequisites: MCS1424 and PHY2413.* Co-requisite: MCS2414. Introductory study of electrostatics, direct currents, magnetism, electromagnetic waves. Light reflection, refraction, and polarization. Imaging by a mirror and lens. Lect. 3 hrs., Studio 1 hr. *3 hours credit*

### **PHY2431 UNIVERSITY PHYSICS 2 LAB**

*Prerequisite: PHY2421.* Co-requisite: PHY2423. Introductory laboratory experiments complementing University Physics 2. Lab. 2 hrs. *1 hour credit*

### **PHY3414 ANALYTICAL MECHANICS**

*Prerequisites: MCS2423, PHY2423.* A study of Newton's laws of motion applied to particles and systems, with an emphasis on velocity-dependent forces, forced/free/damped oscillations, accelerated/rotating systems, gravitational forces, and Lagrangian mechanics. Lect. 4 hrs. *4 hours credit*

### **PHY3574 ELECTRICITY AND MAGNETISM**

*Prerequisites: MCS2423, PHY2423.* Co-requisite: MCS3723. Vector analysis; Coulombs law and electric field intensity, electric flux density, Gauss law and divergence; energy and potential; conductors, dielectrics, and capacitance; experimental mapping methods; Poissons and Laplaces equations. Steady magnetic field, magnetic forces, materials, and inductance; time varying fields and Maxwells equations; the uniform plane wave; the laws of circuit theory. Lect. 4 hrs. *4 hours credit*

### **PHY3611 BASIC CIRCUITS AND ELECTRONIC LAB**

*Co-requisite: PHY3613.* Safety. Proper use of test equipment. Measurement of resistances, measurement of constant voltages and currents, instrument loading, error analysis. Design of voltage and current dividers, T and PI attenuators. Measurement of power, source resistance, Thevenin parameters. Op amps, dependent sources, wave-forms, first and second order transient circuits. Balanced bridges, strain gauges, thermistors, thermocouples. Lab. 2 hrs. *2 hours credit*



**PHY3613 BASIC CIRCUITS AND ELECTRONICS**

*Co-requisites:* MCS2423, PHY2423. Fundamental laws. Circuit parameters, elementary network theory. Forced and transient response, semi-conductor devices, electronic circuits, digital logic and counting circuits. Lect. 3 hrs. *3 hours credit*

**PHY3653 CONTEMPORARY PHYSICS**

*Prerequisites:* MCS2414, PHY2423. Introduction to the concepts of 20th century physics: interference and diffraction, relativity, photoelectric effect, the Heisenberg uncertainty principle, Bohrs model of the atom, Schrodingers wave equation, radioactivity, nuclear reactions, statistical mechanics, condensed matter physics, astrophysics and cosmology. Lect. 3 hrs. *3 hours credit*

**PHY3661 CONTEMPORARY PHYSICS LABORATORY**

*Prerequisite:* PHY2431. *Co-requisite:* PHY3653. Physics major or permission of department chair. Laboratory experiments to complement the material presented in PHY3653 Lab. 3 hrs. *1 hour credit*

**PHY4703 SCIENCE SEMINAR FOR EDUCATORS**

*Prerequisite:* Teacher certification and permission of department chair. Properties and structures of matter, motion, work and heat, energy, sound, light, electric circuits, electromagnetism, and nuclear science. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**PHY4724 QUANTUM MECHANICS**

*Prerequisites:* PHY3653, MCS2423, MCS1142. A theoretical study of the non-relativistic quantum interpretation of matter. Development of wave mechanics, the Schrodinger equation. Formal structure of quantum mechanics. Operators. Solution of one-dimensional and three-dimensional systems. Lect. 4 hrs. *4 hours credit*

**PHY4743 OPTICS, LASERS AND MICROSCOPY**

*Prerequisites:* MCS2414, MCS1142, PHY2423. *Co-requisite:* PHY4781. Geometric and physical optics, wave theory, including microwaves, leading to a discussion of fiber optics, microscopy, coherence theory and the laser. (Serves as a basis for students planning graduate study in optical engineering.) Lect. 3 hrs. *3 hours credit*

**PHY4763 THERMAL PHYSICS**

*Prerequisite:* PHY3653. Logical discussion of entropy, temperature, the Boltzman factor, the chemical potential, the Gibbs factor, distribution functions, semi-conductor statistics, heat and work. Lect. 3 hrs. *3 hours credit*

**PHY4781 OPTICS, LASERS AND MICROSCOPY LABORATORY**

*Prerequisites:* PHY2421, PHY2431. *Co-requisite:* PHY4743. Experiments in optics including lasers, microscopes, telescopes, fiber optics, microwaves and holograms supporting PHY4743 including optical methods used in contemporary science. Lab. 3 hrs. *1 hour credit*

**PHY4823 NUCLEAR PHYSICS**

*Prerequisites:* PHY3653 and PHY3661. Discussion of nuclear structure, radiation, radiation detection, theoretical nuclear models and elementary particles. Lect. 3 hrs. *3 hours credit*

**PHY4843 CONDENSED MATTER PHYSICS**

*Prerequisite:* PHY3653. Brief review of atomic theory, crystal structure, binding forces, mechanical and thermal properties, electrical and magnetic properties of dielectrics, metals, semiconductors and magnetic materials. Lect. 3 hrs. *3 hours credit*

**PHY4912 PHYSICS PROJECT 1**

*Prerequisite:* Senior standing. Practice in experimental or theoretical research techniques through setting up and carrying out projects in classical and modern physics. Lab. 2 hrs. *2 hours credit*

**PHY4922 PHYSICS PROJECT 2**

*Prerequisite:* PHY4912. Continuation of Physics Project 1. Lab. 2 hrs. *2 hours credit*

**PHY4981-3 INTERNSHIP IN PHYSICS**

*Prerequisite:* Permission of the department chair. Internship work experience in physics at a laboratory or industrial placement. A minimum of 5 hours/week (on average) for each credit hour for the 15 week semester. A final report including a log documenting the work done, plus a written assessment from the employer is required for class credit. *1, 2, or 3 hours credit*

**PHY4991-3 DIRECTED STUDY IN PHYSICS**

*Prerequisite:* Permission of department chair. Research or special studies under the direction of a staff member of an experimental or theoretical nature. *1, 2, or 3 hours credit*

**COOPERATIVE EDUCATION IN SCIENCE**

These cooperative education courses presume that the student is doing a parallel program where the student works half-time while taking classes at Lawrence Tech. It is possible to do a full-time co-op by taking two of these courses in sequence during one semester (such as the summer). The completion of two courses is equivalent to one credit-hour. A co-op certificate is given when all six of the courses are successfully completed.

**SCO1000 CO-OP PARALLEL PRACTICUM 1**

*Prerequisites:* 2.25 LTU GPA, departmental approval. First half-time work assignment providing science experience in the workplace. *Credit given upon completion of SCO1001.*

**SCO1001 CO-OP PARALLEL PRACTICUM 2**

*Prerequisites:* Satisfactory completion of SCO1000 and/or departmental approval. Second half-time work assignment providing science experience in the workplace. *1 hour credit*

**SCO2000 CO-OP PARALLEL PRACTICUM 3**

*Prerequisites:* Satisfactory completion of SCO1001 and/or departmental approval. Third half-time work assignment providing science experience in the workplace. *Credit given upon completion of SCO2001.*

**SCO2001 CO-OP PARALLEL PRACTICUM 4**

*Prerequisites:* Satisfactory completion of SCO2000 and/or departmental approval. Fourth half-time work assignment providing science experience in the workplace. *1 hour credit*

**SCO3000 CO-OP PARALLEL PRACTICUM 5**

*Prerequisites:* Satisfactory completion of SCO2001 and/or departmental approval. Fifth half-time work assignment providing science experience in the workplace. *Credit given upon completion of SCO3001.*

**SCO3001 CO-OP PARALLEL PRACTICUM 6**

*Prerequisites:* Satisfactory completion of SCO3000 and/or departmental approval. Sixth half-time work assignment providing science experience in the workplace. *1 hour credit*





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## ABOUT THE COLLEGE OF ENGINEERING

Engineering is a profession in which principles of science, mathematics and economics are applied, using the engineering method to cause changes which benefit society. Engineers endeavor to understand problems, design plans to solve problems, carry out these plans and follow up to check the results obtained. Engineers must be both analytical and creative and must exercise leadership to accomplish goals. Because their actions can influence many lives, engineers must have a strong sense of ethics and an understanding of the society and environment in which they live.

Lawrence Technological University's College of Engineering places high priority on preparing students to enter the profession in industry, government or private practice or to pursue advanced degrees. The curricula provide a strong background in the fundamentals of engineering as well as more specialized topics while emphasizing the core of knowledge and experience common to all the engineering disciplines. Program areas

have been selected to provide students with the greatest flexibility and mobility in their career choices and to avoid over-specialization.

Lawrence Tech's engineering, engineering technology and management programs include both theoretical and practical dimensions consistent with the University's motto, "theory and practice." The faculty consists of engineers and managers distinguished by both strong academic and professional credentials as well as significant industrial experience. Many engineering faculty are concurrently working with industry, which ensures that the program reflects a strong real world orientation. Lawrence Tech's undergraduate programs in civil, electrical, and mechanical engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET), Inc.

### CIVIL ENGINEERING

Working with people and the environment, civil engineers plan, design, construct, operate and maintain structures and facilities such as bridges,

dams, commercial and industrial buildings; transportation facilities including airports, highways, pipelines, ports, and railroads; water supply and wastewater treatment works; deep foundation systems for structures; waste containment facilities; waterways and flood protection; and other public and private projects.

Typical employers include construction and consulting engineering firms, local, state and federal government agencies, and industrial organizations involved in related activities.

Careers may include analysis and design, computer modeling, operation and maintenance of systems and facilities, supervision and coordination of major construction projects. Technical specialization is possible in such areas as construction management, environmental, geotechnical, hydraulics, structural, or transportation engineering.

The mission of the Civil Engineering Department is to offer a program directed toward a broad, high quality, contemporary, baccalaureate educational experience in the civil engineering discipline, in parallel with the guiding principle of the University of "theory and practice."

The objectives of the department are to offer a program:

- designed to provide students with a strong understanding of the fundamental principles of engineering;
- where students have the ability to identify the problem, formulate and analyze engineering alternatives, and solve the problem individually as well as in a team environment;

- that prepares students to apply contemporary computer based skills for the solution of civil engineering problems;
- that prepares students to effectively communicate in a professional engineering environment;
- that stresses all aspects of professionalism including the need for professional development through life-long learning and the benefits of becoming a licensed professional engineer;
- where basic and applied research are conducted to provide improved laboratory facilities, student employment opportunities, and exposure to current faculty research.

The civil engineering program at Lawrence Tech includes 15 elective credits in the senior year. This permits the student to concentrate in construction, environmental, geotechnical, structural, transportation, or water resources engineering; or some combination of the above. Engineering design, the process that sets engineers apart from colleagues in other professional areas, is integrated throughout the curriculum. First year students are introduced to the design process in Civil Engineering Materials and Civil Engineering Perspectives. This is carried out through the junior and senior years during which time design components in all civil engineering disciplines are emphasized. The senior year culminates in a two-semester design project in which design skills, analysis techniques, and real-world constraints all come together in a team project that rounds out the undergraduate education.



Lawrence Tech also offers a graduate program in civil engineering. Three graduate degrees are offered through the department: Master of Civil Engineering (MCE), Master of Science in Civil Engineering (MSCE), and Master of Construction Engineering Management (MCEM). Specializations are available in Environmental, Geotechnical, Hydraulics, and Structural Engineering for the MCE and MSCE degrees. The MCEM degree combines coursework from the Civil Engineering Department and the College of Management. For further information on the graduate program in Civil Engineering, see the *Graduate Catalog*.

## ELECTRICAL AND COMPUTER ENGINEERING

Two degrees are offered in the Electrical and Computer Engineering Department, a Bachelor of Science in electrical engineering, and a Bachelor of Science in computer engineering. The decision as to which degree to pursue should be based on a careful consideration of the student's goals and objectives, compared to the objectives of each of the two programs. Faculty are eager to discuss this and other issues with students. All students should have an advisor-approved plan of work, and see their academic advisor at least once per year. A list of advisors can be obtained from the ECE Office, E217.

The electrical and computer engineering program integrates the design experience throughout its curriculum. This process starts with the freshman level courses, Introduction to Engineering and Engineering Computer Applications Lab. The design experience continues through the junior and senior years using open-ended design exercises to emphasize basic design principles. This process culminates in a two-semester senior design project in which design skills, analysis techniques, and oral and written communication skills all come together in a unified design experience.

The objectives of the ECE Department are to educate students who shall:

- Upon graduation, either become rapidly employed as electrical engineers, or find success in graduate study.
- Possess the proper background to make them productive, reliable, and competitive in their subsequent professional and/or education endeavors.
- Demonstrate and promote the highest standards of ethics and professionalism throughout their careers.

**Bachelor of Science in Electrical Engineering** – Electrical engineers apply electrical, electronic, and magnetic theory to obtain solutions for problems related to the development, design, and operation of electrical hardware and software, control systems, electrical machines and communications systems. Besides development, design, operations, and research, electrical engineers may be involved in manufacture,

installation, and sale of electrical and electronic equipment and are employed by a wide variety of organizations which produce, use, or service this equipment.

Three areas of concentration are available in electrical engineering at Lawrence Tech. *Computer engineering* is intended for those students who wish to emphasize computer and digital system design. *Electronics engineering* is intended for students who want to obtain a specific background in electronic circuit design. Energy Systems is intended for students who wish to emphasize automation, alternative energy, intelligent motion, and power distribution. Each concentration requires an identical core curriculum, three specific concentration courses, two approved technical design electives, and three lab courses associated with concentration and/or technical elective courses.

**Bachelor of Science in Computer Engineering** – The world is in the midst of a technological revolution that is being fueled by continuous improvements in the speed and capabilities of computers. Computer engineers are concerned with the design, development, and implementation of new and challenging computer technology in a myriad of consumer, industrial, commercial, and military applications. For example, every major automotive subsystem (engine, traction, brakes, suspension, climate control, instrument cluster, etc.), on a modern automobile is comput-

er controlled. Working in these areas requires expertise in all aspects of computer hardware and software, and requires the engineer to be able to make hardware/software tradeoffs in developing an optimum system design.

The program at Lawrence Tech is specifically designed with these goals in mind - to give graduating computer engineers the skills necessary to be proficient in both hardware design and computer programming, and to be able to integrate these two areas into a single computer-oriented design.

Students receive a strong background in the principles of electrical engineering from the ECE Department, and computer science from the Math/Computer Science Department. Several courses specifically deal with the challenge of incorporating both hardware and programming designs into a single integrated product design. The program includes a core of electrical engineering and computer science courses, plus one math/science elective, two electrical engineering electives, and two computer science electives. A list of acceptable elective courses can be obtained from the ECE Department office in E217.

## MECHANICAL ENGINEERING

The mission of the Department of Mechanical Engineering is to prepare individuals for careers in mechanical engineering, to provide industry and the profession with well-educated graduates, to help maintain and upgrade the capabilities of practicing engineers, and to generate solu-

tions to industrial problems through applied research.

The department's vision is to be the institution of choice for mechanical engineering education because of an accessible and effective program focused on industry needs and the development of strong professional relationships between students, faculty, and alumni. The objectives of the program in mechanical engineering are to:

- produce graduates capable of applying fundamental science, math, and engineering principles, in conjunction with modern technology, in an interdisciplinary engineering work environment;
- produce graduates who are competent to pursue advanced degrees in engineering;
- produce graduates capable of working in global technical locations as well as in the automotive related industries of Southeast Michigan;
- produce graduates capable of working in teams, utilizing ethical judgment with strong communication and leadership skills;
- produce graduates capable of understanding contemporary global engineering issues and recognizing the importance of lifelong learning;
- provide equivalent day and evening engineering degree programs for both working and full-time students.

Mechanical engineers apply their knowledge of the physical world to solve problems related to the development of consumer products. Their interests cover such diverse topics as automotive engineering, acoustics, machine design, heating and air conditioning, manufacturing engineering,

fluids and hydraulics, stress analysis, computer-aided design/engineering, energy and power production, among many others.

Mechanical engineering is a very versatile degree; graduates may work in such areas as design, analysis, testing, manufacturing, technical sales, and engineering management. Mechanical engineers are employed by a full spectrum of organizations including manufacturers, aerospace, biomedical, government, consulting firms, and research and development organizations.

All mechanical engineering students study the same core curriculum, which includes courses in three broad technical areas: manufacturing, mechanical systems, and thermal science. Manufacturing courses cover how products are made. Mechanical systems courses cover the study of mechanisms and structures. Thermal science courses cover heat transfer, fluid mechanics and energy conversion. Since many new consumer products are electro-mechanical in nature, the core curriculum also includes a sequence in electrical engineering.

As seniors, mechanical engineering students are required to take four technical electives. Students may concentrate in a particular subfield by selecting at least three of the four electives from a special list for that concentration. Four concentrations are offered: automotive engineering, manufacturing, mechanical system design, and thermal system design. Students who do not choose a concentration, or find it inconvenient to do

so, can complete their degree requirements by taking any combination of four technical electives. A list of acceptable electives is available from the Mechanical Engineering Office or from a faculty advisor.

The mechanical engineering program integrates the design experience throughout its curriculum. Student design experience starts with the freshman level Introduction to Engineering and Engineering Computer Applications Lab, and it continues to the capstone senior projects courses, Projects 1 and Projects 2. In lower level courses, primarily open-ended design exercises are utilized to teach various aspects of design. Senior projects provide an extensive, structured design experience with a strong emphasis on teamwork, and oral and written communications.

Lawrence Tech also offers five graduate programs in mechanical engineering: Master of Science in Automotive Engineering, Master of Engineering in Manufacturing Systems, Master of Science in Mechanical Engineering, Master of Engineering Management, and Doctorate of Engineering in Manufacturing Systems. These programs are described in the *Graduate Catalog*.

## FE EXAM

Candidates for degrees in civil, electrical, or mechanical engineering are strongly encouraged to complete the Fundamentals of Engineering (FE) Examination administered by the National Council of Engineering Examiners.

## ENGINEERING TECHNOLOGY

**Associate degrees** – The Department of Engineering Technology in the College of Engineering offers the opportunity to prepare for rewarding and responsible careers in support and management of technical and engineering activities in business and industry. Students may earn an associate degree with a major in construction, electrical, mechanical, manufacturing engineering technology, or electrical contracting technology. These programs enable graduates to participate as part of the engineering/technical team as technologists and technicians.

Working under the supervision of engineers, scientists or technologists, technicians are employed in a wide variety of industry, business and government organizations involved in manufacturing, development, design and testing, computer applications, electronics, construction, regulation, quality control, maintenance, and sales, to name a few examples.

While the associate degree is sufficient for many students who seek full-time employment as technicians, or for those who plan to seek an additional degree, several alternatives are available at Lawrence Tech. Students may combine technical courses with business and management courses to earn both an associate degree and a Bachelor of Science degree in technology management. Other students may choose to first earn an associate degree, and then to begin earning a Bachelor of Science degree in engineering technology, technology management, industrial management, or some other major.



Students interested in any alternative should consult the department chairs of each program involved to determine an appropriate course plan.

**Bachelor's degrees** – Students who hold an associate degree in a technical discipline may enroll in a program leading to the Bachelor of Science degree in engineering technology. This program adds a broader technical base to the highly specialized associate degree programs allowing graduates to exercise a higher level of technical responsibility while also providing the general education and administrative skills required for most technical supervisory roles.

Graduates of this program are often technologists in the engineering/technical team and are employed by industrial and business organizations in both technical and supervisory/management and sales roles. This program is especially useful to upwardly mobile technicians who are preparing for new career opportunities based on their technical skills.

The *industrial management*\* degree (B.S.I.M.) includes specific course work which has special applicability to operations management situations in both manufacturing and service organizations. It has been an especially attractive degree to major manufacturing operations such as the automotive industry and its suppliers.

The *technology management*\* (B.S.T.M.) degree is a unique degree that combines the foundations of both technology and management into one program. It provides a strong, well-balanced combination of technology and management courses to pro-

duce a graduate who is uniquely suited to function effectively in both technical and managerial capacities, and thus follows the University's long tradition of emphasizing strong skill development by combining theory and practice.

Since the academic backgrounds of entering students vary widely, Lawrence Tech is in an especially advantageous position to provide academic and career advising on an individualized basis to assist students in fulfilling their academic and career foundation goals. Each student is assigned an academic advisor upon entering the program and is able to contact this advisor to be certain that the path they are pursuing is leading to the desired goal.

Course work for the technology management degree differs in some notable ways from the B.S.I.M. program and this is reflected in specific technology management majors. The technology management degree has a more rigorous science requirement and a technology, natural science, or engineering core that sets it apart from the B.S.I.M. degree.

The Bachelor of Science in *construction management* (B.S.C.M.) degree was new for Fall of 2000. The B.S.C.M. is intended for the professional who is employed in the construction industry. The program is designed for the person who works full-time. This does not preclude a full-time student from actively pursuing a degree, but it must be understood that the majority of the classes for this program are offered in the evening. A student who has completed the Associate of Science in con-

struction engineering technology can transfer the full program into the B.S.C.M.

The B.S.C.M. is designed to the specifications of the American Council of Construction Education. It is supported by the Associated General Contractors, Greater Detroit Chapter.

*\*The B.S.I.M. and B.S.T.M. will be offered through the College of Arts and Sciences beginning fall 2005.*

## ACADEMIC AND INDUSTRIAL PARTNERSHIP IN EDUCATION

### Associate of Science in Manufacturing Engineering/Technology (Greenfield Coalition program):

The Greenfield Coalition for New Manufacturing Education has developed an innovative college-level manufacturing engineering curriculum, integrating experiential learning in the degree program. The curriculum offers associate and baccalaureate degrees in manufacturing engineering and technology. The Coalition consists of:

- Five major universities: Lawrence Tech, Lehigh University, University of Detroit Mercy, University of Michigan, and Wayne State University.
- Six corporate partners: DaimlerChrysler Corporation, Cincinnati Machine Corp., Detroit Diesel, EDS, Ford Motor Company, and General Motors Corporation.
- The Society of Manufacturing Engineers
- Focus: HOPE

The Associate of Science in manufacturing engineering/technology degree is awarded by Lawrence Tech. The program is unique in its design and all academic work is done at the Center for Advanced Technologies at Focus: HOPE. The Center contains a state of the art manufacturing facility and is the location for the academic programs.

The degree candidates are accepted into the program after completion of 52 weeks at the Machinist Training Institute where they receive training in precision machining and met-



alworking along with other academic skills. At the Center, the candidate works 40 hours per week at various manufacturing job rotations while taking electronically delivered college-level courses with the assistance of faculty coaches and on-site tutors. The integrated engineering experience provides an education for advanced manufacturing engineer-technologists at world competitive levels.

Further information on admission to this special program is available through the Greenfield Coalition Program Manager, 248.204.2069 or visit the office in E179

## LEAR ENTREPRENEURIAL CENTER

The Lear Entrepreneurial Center at Lawrence Technological University offers students from various disciplines the opportunity to work in a business-model setting to solve real-world engineering problems. Students enrolled in this program can earn a Certificate in Entrepreneurship while pursuing an engineering degree with no additional semester credit hour requirement. Within the College of Engineering, Entrepreneurship Certificates are offered in the Mechanical Engineering, Civil Engineering, and Electrical and Computer Engineering Departments.

The entrepreneurial program addresses entrepreneurial management in start-up ventures and new business development in existing companies. The program provides a vehicle for sharpening skills in business

process and teamwork as well as industry specific technical skills. These skills are designed for students to start their own companies, work in small businesses, or initiate jobs in larger companies.

The certificate program consists of courses, conferences, internships and student run enterprises, which are designed to provide entrepreneurship education in which inquiry, creativity, and innovation are the norm, and theory and practice go hand-in-hand.

## GLOBAL ENGINEERING CERTIFICATE PROGRAM

The Global Engineering certificate at Lawrence Technological University offers students a unique opportunity to study internationally and work in an international multicultural business environment. The program has been launched with partner universities and international engineering companies.

It is an undergraduate program for Lawrence Tech students involving studying one semester and working one semester abroad. In return, international students are invited to work and study at Lawrence Tech. The Global Engineering certificate program is an extension of cooperative education incorporating an international experience — both work and study. A certificate is presented to students who successfully complete the requirements of the program.

The Global Engineering program was created to address the increasing need for engineers with international understanding and experience. The program opens the doors to great opportunities for students in the U.S. and abroad — to experience cultural and technological advantages, and gain a common understanding of different cultures in a global business.

Lawrence Tech students who participate in the program live with other international students in college housing overseas.

Student participants in the Global Engineering program are among a select few. Applicants must meet requirements of the traditional Lawrence Tech Co-op Program, and be selected to participate in this international experience. The coordinator of Global Engineering and representatives of international corporations interview applicants to the GEC program. Students who are accepted into this program will receive a corporate sponsored scholarship that partly subsidizes their educational and travel expenses while living and studying abroad.

## COOPERATIVE EDUCATION

**Engineering and Engineering Technology:** A co-op program is offered for qualified students in civil, electrical, computer, and mechanical engineering and engineering technology who have reached the junior year. To be accepted as a co-op student, applicants must have completed all the mathematics,

science, English and communications requirements of the common core by the first work period; and must successfully complete a personal interview with the program director. A minimum cumulative GPA of 2.25 is required. Transfer students must have completed at least one semester at Lawrence Tech prior to the first work assignment.

Co-op placement depends on the availability of appropriate jobs in industry. The employer makes the final selection of candidates. Consequently, Lawrence Tech cannot guarantee that applicants, otherwise qualified, will be placed in a co-op position.

Co-op students alternate between periods of study in school and periods of employment in industry. Both types of learning experiences are planned and supervised to contribute to the students' education and employability.

The work assignment provided by the employer is approved by the co-op director in association with an engineering faculty member. Co-op companies are expected to provide workplace experience related to the student's major.

Co-op students are paid by their employer. Interested students can obtain complete information, including limitations and requirements, by contacting the office of Career Services.

## BACHELOR OF SCIENCE IN CIVIL ENGINEERING

Total Semester credit hours: 131

### FRESHMAN YEAR

#### FIRST SEMESTER

COURSE No.	SUBJECT	Cr. Hrs.	COURSE No.	SUBJECT	Cr. Hrs.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2413	Found Am Exper	3
ECE1101	CE Comp Graph Lab	1	MCS1424	Calculus 2	4
ECE1102	Comp App Lab	2	GLG1103	Geology	3
MCS1414	Calculus 1	4	ECE1413	CE Materials	3
CHM1213	Univ Chemistry 1	3			
CHM1221	Univ Chem 1 Lab	1			
ECE1012	Civil Engr Perspect	2			
			17		

#### SECOND SEMESTER

16

### SOPHOMORE YEAR

COM2103	Tech & Prof Comm	3	EGE2013	Statics	3
LLT1223	World Masterpcs 2	3	EEE2123	Circuits & Elec	3
ECE1013	Surv & Land Meas	3	MCS2423	Diff Equations	3
MCS2414	Calculus 3	4	PHY2423	Univ Physics 2	3
PHY2413	Univ Physics 1	3	PHY2431	Univ Physics 2 Lab	1
PHY2421	Univ Physics 1 Lab	1	SSC2423	Devel Am Exper	3
			17		

### JUNIOR YEAR

SSC2303	Basic Economics	3	ECE3213	Construction Engr	3
MCS3403	Prob & Statistics	3	ECE3324	Environ Engr 1	4
ECE3523	Hydromechanics	3	ECE3424	Geotechnical Engr	4
EGE3012	Engr Cost Analysis	2	ECE3723	Theory of Structures	3
ECE3013	Mech of Materials	3	ECE3823	Transportation Engr	3
	Engr Sci Elective	3			
			17		

### SENIOR YEAR

ECE4021	CE Design Proj 1	1	ECE4033	CE Design Proj 2	3
ECE4051	Ethics & Prof Issues	1	ECE4761	Struc Des Test Lab	1
ECE4544	Hydraulic Engr	4	LLT/SSC	Jr/Sr Elective	3
ECE4743	Concrete Design	3		Civil Engr Electives	9
	Civil Engr Electives	6			
			15		

*Engineering Science Elective (3 credits): One course to be selected from the following: EGE3003 Thermodynamics, EGE3043 Dynamics, or EME4613 Introduction to Thermal Systems (non-ME).*

*Technical Electives (15 credits): Five technical electives to be chosen from the following list of courses so that the design credits equal or exceed seven*

Graduate-level courses can also be used to fulfill technical elective elements. Up to seven credits of graduate-level courses, taken while enrolled as an undergraduate student, can be applied towards a Master's degree.

Today, being an engineer isn't enough. Industry is looking for engineers who not only possess the technical skills of an engineering degree, but who also have a background in business practices

that gives them the savvy to meld engineering skills with the practicalities of business. Students majoring in civil engineering at Lawrence Tech have the unique option to get a certificate in Entrepreneurship in addition to their engineering degree for the same number of credits. For more information about the program, please visit the Lear Entrepreneurial Center website: [learcenter@ltu.edu](mailto:learcenter@ltu.edu).

#### TECHNICAL ELECTIVE

#### DESIGN CREDITS

ECE4243	Civil Engr Management Principles	0
ECE4263	Cost Estimating, Bidding & Contracting	0
ECE4343	Environmental Engineering 2	1
ECE4563	Hydrology	1
ECE4733	Advanced Structural Analysis	0
ECE4363	Environmental Design	3
ECE4443	Foundation Engineering	3
ECE4623	Project Design, Planning & Scheduling	1
ECE4753	Steel Design	3
ECE4843	Highway Engineering	3

*See your academic advisor for elective requirements and further specific information on your degree program.*

Dual majors will be permitted a number of substitutions as approved by the department chairman consistent with accreditation requirements.

#### CIVIL ENGINEERING ADVISOR:

Contact the Civil Engineering Department, 248.204.2545, room E023, for your assigned faculty advisor (they are assigned by student number).



## BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

Total Semester credit hours: 131

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2413	Found Am Exper	3
MCS1142	Intro to C	2	MCS1424	Calculus 2	4
MCS1414	Calculus 1	4	MCS1514	Computer Sci 1	4
CHM1213	Univ Chemistry 1	3	EGE1201	Eng Comp App Lab	1
CHM1221	Univ Chem 1 Lab	1	EGE1301	Engr Comp App Lab	1
EEE1002	Intro to ECE	2			
		16			16

### SOPHOMORE YEAR

LLT1223	World Masterpcs 2	3	MCS2423	Diff Equations	3
MCS2414	Calculus 3	4	MCS2534	Data Structures	4
COM2103	Tech & Prof Com	3	PHY2423	Univ Physics 2	3
PHY2413	Univ Physics 1	3	PHY2431	Univ Physics 2 Lab	1
PHY2421	Univ Physics 1 Lab	1	EEE2114	Circuits 1	4
MCS2514	Computer Sci 2	4	EEE2111	Circuits 1 Lab	1
			EEE3XX1	Business Plans	1
		18			17

### JUNIOR YEAR

MCS2523	Discrete Math	3	EEE3233	Microprocessors	3
MCS3403	Prob & Statistics	3	EEE3231	Microproc Lab	1
SSC2423	Devel Amer Exp	3	EEE3314	Electronics	4
EEE3123	Circuits 2	3	EEE3311	Electronics Lab	1
EEE2213	Digital Electronics	3	EEE3223	Adv Digital Elec	3
EEE2211	Digital Electr Lab	1	EEE3221	Adv Digital Lab Elec	1
			EEE3011	Intro to ECE Proj	1
			SSC2303	Prin of Economics	3
			EGE2231	Project Management	1
		16			18

### SENIOR YEAR

EEE4273	Real Time Systems	3	MCSXXX3	Comp Sci Tech Elec	3
EEE4513	Control Systems	3	EEE4XX1	EE Lab	1
EEE4511	Control Syst Lab	1	EEE4842	ECE Projects 2	2
EEE4831	ECE Projects 1	1	EEE4XX3	EE Tech Elective	3
EEE4253	Comp Architecture	3	EEE4XX3	Comp Eng Elective	3
EGEXXX1	Entrepr. Tech Elective	1	LLT/SSC/		
EEE4XX3	EE Tech Elective	3	PSY	Jr/Sr Hum Elective	3
		15			15

\* See the Electrical and Computer Engineering Department for a list of approved Computer Science and Computer Engineering electives.

A list of Technical Elective courses is available from the Electrical and Computer Engineering Department, E217.

Dual majors will be permitted a number of substitutions as approved by the department chairman consistent with accreditation requirements.

### ELECTRICAL AND COMPUTER ENGINEERING ADVISOR:

Each student should have an advisor-approved Plan of Work. Contact the Electrical and Computer Engineering Department, Room E217 for your faculty advisor.

## BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

Total Semester credit hours: 131

### FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2413	Found Am Exper	3
MCS1142	Intro to C	2	MCS1424	Calculus 2	4
MCS1414	Calculus 1	4	SSC2303	Prin of Economics	3
CHM1213	Univ Chemistry 1	3	EGE1201	Eng Comp App Lab	1
CHM1221	Univ Chem 1 Lab	1	EGE1301	Engr Comp App Lab	1
EEE1002	Intro to ECE	2			
		16			15

### SOPHOMORE YEAR

COM2103	Tech & Prof Comm	3	MCS2423	Diff Equations	3
LLT1223	World Masterpcs 2	3	PHY2423	Univ Physics 2	3
MCS2414	Calculus 3	4	PHY2431	Univ Physics 2 Lab	1
PHY2413	Univ Physics 1	3	SSC2423	Devel Am Exper	3
PHY2421	Univ Physics 1 Lab	1	EME4603	Intro to Mech Sys	3
EEE2213	Digital Electronics	3	EEE2114	Circuits 1	4
EEE2211	Digital Elect Lab	1	EEE2111	Circuits 1 Lab	1
		18			18

### JUNIOR YEAR

MCS3403	Prob & Statistics	3	EEE3XX1	Business Plans	1
MCS3413	Adv Engr Math	3	EEE3011	Intro to ECE Proj	1
EEE3233	Microprocessors	3	EEE3314	Electronics	4
EEE3231	Microproc Lab	1	EEE3311	Electronics Lab	1
EME4613	Intro Thermal Syst	3	EEE3414	Electrom Fields	4
EEE3123	Circuits 2	3	EEEXXX3	EE Concentr #1	3
EEE3121	Circuits 2 Lab	1	EEEXXX1	EE Lab	1
			EGE2231	Project Management	1
		17			16

### SENIOR YEAR

EEE3422	Adv Comp Appl Lab	2	EEE4423	Comm Systems	3
EEE4513	Control Systems	3	EEE4XX3	EE Concentr #3	3
EEE4511	Control Syst Lab	1	EEE4XX3	EE Tech Elective	3
EEE4811	EE Projects 1	1	EEE4822	EE Projects 2	2
EEE4XX3	EE Concentr #2	3	EEE4XX1	EE Lab	1
EGEXXX1	Entreprn Tech Elect	1	LLT/SSC/		
EEE4XX3	EE Tech Elective	3	PSY	Jr/Sr Hum Elective	3
EGE3012	Eng Cost Analysis	2			
		16			15

Labs are required with a number of concentration and Technical Elective courses; these can be used to satisfy the general EE lab requirements. A list of Technical Elective courses is available from the Electrical and Computer Engineering Department, E217.

Continued



Requirements for the three concentration courses are:

**Computer Engineering**

- EEE3223 Adv Digital
- EEE4253 Comp Arch 1
- EEE4XX3 Comp Elective

**Electronics Engineering**

- EEE3223 Adv Digital
- EEE4123 Elec Machines
- EEE4543 Process Controls

**Electrical and Power Engineering**

- EEE3513 Intro Electr Sys
- EEE4153 Electr Machines
- EEEXX3 Energy Tech Elective
- EEE4543 Process Controls

Dual majors will be permitted a number of substitutions as approved by the department chair consistent with accreditation requirements.

**ELECTRICAL AND COMPUTER ENGINEERING ADVISOR:**

Each student should have an advisor-approved Plan of Work. Contact the Electrical and Computer Engineering Department, room E217 for your faculty advisor.

**BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING**

Total Semester credit hours: 131

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	Cr. Hrs.	COURSE No.	SUBJECT	Cr. Hrs.
COM1001	University Seminar	1	LLT1213	World Masterpcs 1	3
COM1103	English Comp	3	SSC2413	Found Amer Exp	3
MCS1414	Calculus 1	4	MCS1424	Calculus 2	4
CHM1213	Univ Chemistry 1	3	EGE1023	Engr Materials	3
CHM1221	Univ Chem 1 Lab	1	EGE1101	ECAL-Excel	1
EGE1012	Intro to Engr	2	EGE1201	ECAL-MathCAD	1
SSC2303	Principles of Econ	3	EGE1301	ECAL-Mat Lab	1
			17		

**SOPHOMORE YEAR**

COM2103	Tech & Prof Com	3	SSC2423	Devel Am Exper	3
LLT1223	World Masterpcs 2	3	MCS2423	Diff Equations	3
MCS2414	Calculus 3	4	PHY2423	Univ Physics 2	3
PHY2413	Univ Physics 1	3	PHY2431	Univ Physics Lab	1
PHY2421	Univ Phys 1 Lab	1	EGE2013	Statics	3
EME2012	ME Graphics	2	EME3023	Mfg Processes	3
			EME2011	Engr Matls Lab	1
			16		

**JUNIOR YEAR**

MCS3403	Prob & Statistics	3	EME3011	Intro Engr Proj	1
EEE2123	Circuits & Elect	3	EEE3153	Elect Mach Ctrl	3
EGE3003	Thermodynamics	3	EEE3161	Intro to EE Lab	1
EME3013	Mech of Materials	3	EME3024	Fluid Mechanics	4
EME3043	Dynamics	3	EME3034	Kin & Dyn Mach	4
EME3033	Eng Num Methods	3	EME4003	Des Mach Elem	3
			18		

**SENIOR YEAR**

EME4212	Engr Projects 1	2	EME4222	Engr Projects 2	2
EME4402	Mechanics Lab	2	EME4412	Thermal Sci Lab	2
EME4013	Heat Transfer	3	EME4XX3*	Tech Elective	3
EME4XX3*	Tech Elective	3	EME4XX3*	Tech Elective	3
EME4XX3*	Tech Elective	3	LLT/SSC3	Jr/Sr Elective	3
MCS3413	Adv Eng Math	3			
EGE3012	Eng Cost Analy	2			
			18		

*Continued*



**Requirements for Entrepreneurial Certificate in Mechanical Engineering:**

**SOPHOMORE YEAR**

COURSE No.	SUBJECT	CR. HRS.
COM2103	Tech & Prof Com	3
EGE2201	Finance for Engrs	1
EGE2211	Marketing for Engrs	1
EME2221	Engr Enterprise 1	1

**JUNIOR YEAR**

EGE3301	Bus Law for Engrs.	1
EGE3311	Strat Mgmt. for Engrs	1
EME3321	Engr Enterprise 2	1
EGE3341	Business Plan Dev	1
EME3331	Engr Enterprise 3	1

**SENIOR YEAR**

EGE4XX1	Entrep Elective	1
EGE4XX1	Entrep Elective	1
EME4212	Capstone Des 1	2
EME4222	Capstone Des 2	2
		17

See your academic advisor for elective requirements and further specific information on your degree program.

\* Undergraduate B.S.M.E. students maintaining a minimum 3.0 GPA may also select electives from EME5XX3 courses.

Dual majors will be permitted a number of substitutions as approved by the department chairman consistent with accreditation requirements.

**MECHANICAL ENGINEERING ADVISOR:**

Contact the Mechanical Engineering Records Office, room E31, ext 2592, for your faculty advisor (they are assigned by student number).

If you cannot reach your advisor, contact the Mechanical Engineering Office, ext. 2550, room E29.

**BACHELOR OF SCIENCE IN INDUSTRIAL MANAGEMENT**

Recommended course scheduling for part-time students.

**Total Semester credit hours: 121**

**FIRST SEMESTER**

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
MCS1214	Math Anal 1	4
PSC1113	Phys Science 1	3
COM1103	English Comp	3
		11

**SECOND SEMESTER**

COURSE No.	SUBJECT	CR. HRS.
MCS1224	Math Anal 2	4
PSC1123	Phy Science 2	3
PSC1131	Phy Science Lab	1
LLT1213	World Masterpcs 1	3
		11

**THIRD SEMESTER**

MCS2113	Statistics 1	3
LLT1223	World Masterpcs 2	3
SSC2313	Macroeconomics	3
		9

**FOURTH SEMESTER**

MCS2123	Statistics 2	3
COM2103	Tech & Prof Com	3
SSC2323	Microeconomics	3
		9

**FIFTH SEMESTER**

SSC2413	Found Am Exper	3
MGT2203	Mgt & Supervision	3
ACC2013	Principles Acctg 1	3
		9

**SIXTH SEMESTER**

SSC2423	Devel Am Exper	3
MGT2113	Intro Bus Law	3
ACC2023	Principles Acctg 2	3
		9

**SEVENTH SEMESTER**

HRM3013	Org Behavior	3
MKT3013	Principles Mkt	3
FIN3103	Intro Finance Mgt	3
		9

**EIGHTH SEMESTER**

INT3023	Info Tech Inaugural	3
TOM3113	Operations Mgt	3
COM3103	Adv Prof Comm	3
		9

**NINTH SEMESTER**

XXX3	Op Mgt Elect	3
XXX3	Op Mgt Elect	3
XXX3	Indust Elect	3
		9

**TENTH SEMESTER**

XXX3	Op Mgt Elect	3
XXX3	Indust Elect	3
MGT4213	Strategic Mgt	3
		9

**ELEVENTH SEMESTER**

XXX3	Indust Elect	3
XXX3	Indust Elect	3
XXX3	Indust Elect	3
		9

**TWELFTH SEMESTER**

LLT/SSC3	Jr/Sr Hum Elect	3
XXX3	Open Elective	3
XXX3	Open Elective	3
		9

**Note:** Progress may be accelerated by completing additional courses in any semester including summer.

**B.S.I.M. UPPER DIVISION REQUIREMENTS**

**Operations Management Electives**

COURSE No.	SUBJECT	CR. HRS.
HRM3023	Personnel/HR Mgt	3
HRM4013	Empl/Mgt Relations	3
HRM4033	HR Prob & Policies	3
MKT3043	Logistics Mgt	3
TOM4123	Adv Oper Mgt	3
TOM4093	Ind Study in Op Mgt	3
TIE2123	Project Mgt	3

**Industrial Electives**

EGE1012	Intro to Engineering	2
MKT3073	Technical Sales	3
TIE2013	Prod & Work Meas	3
TIE2033	Ergonomics & Saf	3
TIE2063	Manufac Proc 1	3
TIE2093	Metrology & QC	3
TIE2153	Manufac Proc 2	3
TME1023	Tech Graphics	3

Choose 8 courses from the combined lists of Operations Management Electives and Industrial Electives. At least 3 of the 8 courses should be Operations Management Electives. Total semester credit hours for the Industrial Management degree are a minimum of 121.

**BACHELOR OF SCIENCE IN TECHNOLOGY MANAGEMENT**

Recommended course scheduling for part-time students in computer, construction, electrical and manufacturing technology majors.

**Total Semester credit hours: 121**

**FIRST SEMESTER**

COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1	COM1103	English Comp	3
CHM1154	Intro Chem Prin	4	MCS1113	Tech Math 1	3
MCS1023	Tech Comp Appl	3	PHY1063	Tech Physics 1	3
			PHY1100	Tech Physics Lab	0
		8			9

**SECOND SEMESTER**

**THIRD SEMESTER**

LLT1213	World Masterpcs 1	3	LLT1223	World Masterpcs 2	3
MCS1123	Tech Math 2	3	MCS2313	Tech Calculus	3
PHY1083	Tech Physics 2	3	MGT2113	Intro Business Law	3
PHY1101	Tech Physics Lab	1			
		10			9

**FOURTH SEMESTER**

**FIFTH SEMESTER**

MCS2113	Statistics 1	3	MCS2123	Statistics 2	3
SSC2313	Macroeconomics	3	SSC2323	Microeconomics	3
XXX3	Tech Course	3	XXX3	Tech Course	3
		9			9

**SIXTH SEMESTER**

**SEVENTH SEMESTER**

MGT2203	Mgt & Supervision	3	INT3023	Info Tech Inaugural	3
SSC2413	Found Amer Exper	3	SSC2423	Develop Amer Exp	3
XXX3	Tech Course	3	XXX3	Tech Course	3
		9			9

**EIGHTH SEMESTER**

**NINTH SEMESTER**

ACC2103	Principles Acctg	3	ACC2023	Principles Acctg	3
COM2103	Tech & Prof Comm	3	TOM3113	Operations Mgt	3
XXX3	Tech Course	3	XXX3	Tech Course	3
		9			9

**TENTH SEMESTER**

**ELEVENTH SEMESTER**

FIN3103	Intro Finance Mgt	3	COM3103	Adv Prof Comm	3
HRM3013	Org Behavior	3	TIE2103	Prod & Wrk Meas	3
XXX3	Tech Course	3			
		9			6

**TWELFTH SEMESTER**

**THIRTEENTH SEMESTER**

LLT/SSC3	Jr/Sr Hum Elective	3	MGT4213	Strategic Mgt	3
MKT3103	Prin of Marketing	3	TIE4115	Senior Projects	5
XXX2	Tech Course	2			
		8			8

**FOURTEENTH SEMESTER**

*Note: Progress may be accelerated by completing additional courses in any semester including summer.*



## B.S.T.M. COMPUTER TECHNOLOGY MAJOR REQUIREMENTS (10 courses)

COURSE No.	SUBJECT	CR. HRS.
MCS1514	Computer Science 1	4
MIS3023	Bus Sys Anal & Des	3
TIE2013	Prod & Work Meas	3

**Plus at least seven courses from the following\*:**

ACC4023	EDP Audit and Controls	3
MCS2514	Computer Science 2	4
MCS2524	Discrete Math	4
MCS2534	Data Structures	4
MCS3513	Assembler	3
MCS3543	Database Systems	3
MCS3653	Computer Architecture	3
MCS4623	Software Engineering	3
MIS4013	Sys Develop Project	3
MIS4023	Data Comm Systems	3

## B.S.T.M. CONSTRUCTION TECHNOLOGY MAJOR REQUIREMENTS (10 courses)

TCE2013	Arch Graphics	3
TCE2143	Specs & Regulations	3
TIE2013	Prod & Work Meas	3
TIE2123	Project Management	3
TIE4115	Senior Project	5

**Plus at least five courses from the following\*:**

TCE2013	Construction Tech 1	3
TCE2033	Soils	3
TCE2053	Construction Tech 2	3
TCE2073	Surveying	3
TCE2093	Structures	3
TCE2123	Estimating	3
TME2013	Statics	3
TME2033	Mechanics of Materials	3

## B.S.T.M. ELECTRICAL TECHNOLOGY MAJOR REQUIREMENTS (10 courses)

TEE1023	Circuits 1	3
TEE2013	Circuits 2	3
TEE2033	Electronics 1	3
TEE2053	Electronics 2	3
TEE2073	Electrical Drawing	3
TIE2013	Prod & Work Meas	3
TIE4115	Senior Project	5

**Plus at least three courses from the following\*:**

TEE2093	Electronics 3	3
TEE2123	Microprocessors	3
TEE2143	Electrical Machines	3
TEE2163	Electronic Comm	3
TEE2183	Indust Electronics	3
TIE2123	Project Mgt	3

## B.S.T.M. MANUFACTURING TECHNOLOGY MAJOR REQUIREMENTS (10 courses)

COURSE No.	SUBJECT	CR. HRS.
TEE3103	AC/DC Circuits	3
TIE2063	Manufacturing Proc 1	3
TIE2013	Prod & Work Meas	3
TIE2143	Manufacturing Proc 2	3
TIE4115	Senior Project	5
TME2143	Materials 1	3
TME3113	Engineering Mechanics	3

**Plus at least three courses from the following\*:**

ACC3033	Cost Accounting	3
FIN4023	Fin Anal & Planning	3
HRM4013	Employ/Mgt Relations	3
MKT3043	Logistics Management	3
TIE2033	Ergonomics & Safety	3
TIE2093	Metrl & Quality Control	3
TIE2123	Project Management	3
TME1023	Tech Graphics	3
TOM4123	Adv Operations Mgt	3

## B.S.T.M. MECHANICAL TECHNOLOGY MAJOR REQUIREMENTS (13 courses)

TIE2173	Automatic Control Systems	3
TIE2013	Prod & Work Meas	3
TIE2063	Mfg Processes 1	3
TIE4115	Senior Project	5
TME1023	Tech Graphics	3
TME2013	Statics	3
TME2033	Mech of Materials	3
TME2053	Dynamics	3
TME2073	Thermodynamics	3
TME2123	Fluids	3
TME2143	Materials 1	3
TME2163	Computer Graphics	3
TME2213	Mechanical Design	3

An Associate of Science degree may be earned en route to the B.S.T.M. degree with construction, electrical, manufacturing, and mechanical technology majors by completing up to three additional courses.

\* Or other courses approved by the program academic advisor.



## BACHELOR OF SCIENCE IN CONSTRUCTION MANAGEMENT

Courses required to complete the B.S.C.M. degree:

**Total Semester credit hours: 125**

### MATH/SCIENCE CORE

COURSE No.	SUBJECT
MCS1023	Tech Comp Appl
MCS1113	Tech Math 1
MCS1123	Tech Math 2
MCS2313	Tech Calculus
MCS2023	Statistical Methods
PHY1063	Tech Physics 1
PHY1100	Tech Physics 1 Lab
PHY1083	Tech Physics 2
PHY1101	Tech Physics 2 Lab
CHM3144	Fund Chemistry

### HUMANITIES CORE

COM1001	University Seminar
COM1103	English Composition
COM2103	Tech & Prof Comm
LLT1213	World Masterpcs 1
LLT1223	World Masterpcs 2
HRM3013	Organizational Behav
SSC2413	Found of Amer Exper
SSC2423	Dev of Amer Exper
SSC3723	Ethics

### MANAGEMENT CORE

INT3023	Info Tech Inaugural
HRM4013	Empl/Mgt Relations
MGT2113	Intro to Business Law
MGT2203	Mgt & Supervision
SSC2303	Basic Economics
TIE2163	Engr Econ & Acct

### CONSTRUCTION SCIENCE

COURSE No.	SUBJECT
ARC2514	Structures 1 or TME2013 Statics
ARC3523	Structures 2 or TME2033 Mech of Mats
ARC4533	Structures 3
TCE2143	Specs and Regulations
TCE1023	Arch Graphics
TCE2013	Constr Tech 1
TCE2033	Soils
TCE2053	Constr Tech 2
TCE3113	Constr Tech 3
TCE2073	Surveying

### CONSTRUCTION CORE

TCE2123	Estimating
TCE4113	Constr Safety
TIE2123	Project Management
TIE4115	Senior Project

### CONST & MGT ELECTIVES

(11 credit hours required)

ECE4263	Cost Est, Bid & Cont
ECE4623	Proj Plan, Des & Sched
TOM3113	Operations Mgt
TCE4112	Construction Equi
TCE4122	Value Engineering
TCE4123	Hwy Design & Est
TIE2013	Prod & Work Measure

## ASSOCIATE OF SCIENCE IN CONSTRUCTION ENGINEERING TECHNOLOGY

**Total Semester credit hours: 65**

### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
MCS1023	Tech Comp Appl	3
MCS1113	Tech Math 1	3
SSC2303	Basic Economics	3
10		

### THIRD SEMESTER

MCS2313	Tech Calc	3
PHY1083	Tech Phys 2	3
PHY1101	Tech Phys Lab 2	1
TCE1023	Arch Graphics	3
10		

### FIFTH SEMESTER

TCE2013	Construct Tech 1	3
TCE2033	Soils	3
TCE2073	Surveying	3
9		

### SEVENTH SEMESTER

TCE2093	Structures	3
TCE2123	Estimating	3
TCE2143	Specs & Reg	3
9		

### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1103	English Comp	3
MCS1123	Tech Math 2	3
PHY1063	Tech Phys 1	3
PHY1100	Tech Phys Lab 1	0
9		

### FOURTH SEMESTER

COM2103	Tech & Prof Comm	3
MCS2323	Applied Diff Eq*	3
TME2013	Statics or	
ARC2514	Structures 1	3
9		

### SIXTH SEMESTER

TCE2053	Const Tech 2	3
TME2033	Mech of Materials or	
ARC3523	Structures 2	3
TIE2123	Project Mgt	3
9		

\*or Statistical Methods (MCS2023)

## ASSOCIATE OF SCIENCE IN MANUFACTURING ENGINEERING TECHNOLOGY

**Total Semester credit hours: 65**

### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1
MCS1023	Tech Comp Appl	3
MCS1113	Tech Math 1	3
TME1023	Tech Graphics	3
10		

### THIRD SEMESTER

SSC2303	Basic Economics	3
MCS2313	Tech Calc	3
PHY1083	Tech Physics 2	3
PHY1101	Tech Phys Lab 2	1
10		

### FIFTH SEMESTER

TIE2013	Prod & Work Meas	3
TME2013	Statics	3
TIE2063	Mfg Processes 1	3
9		

### SEVENTH SEMESTER

TEE2173	Automatic Ctrl Sys	3
TIE2153	Mfg Processes 2	3
TIE2123	Project Mgt	3
9		

### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.
COM1103	English Comp	3
MCS1123	Tech Math 2	3
PHY1063	Tech Phys 1	3
PHY1100	Tech Phys Lab 1	0
9		

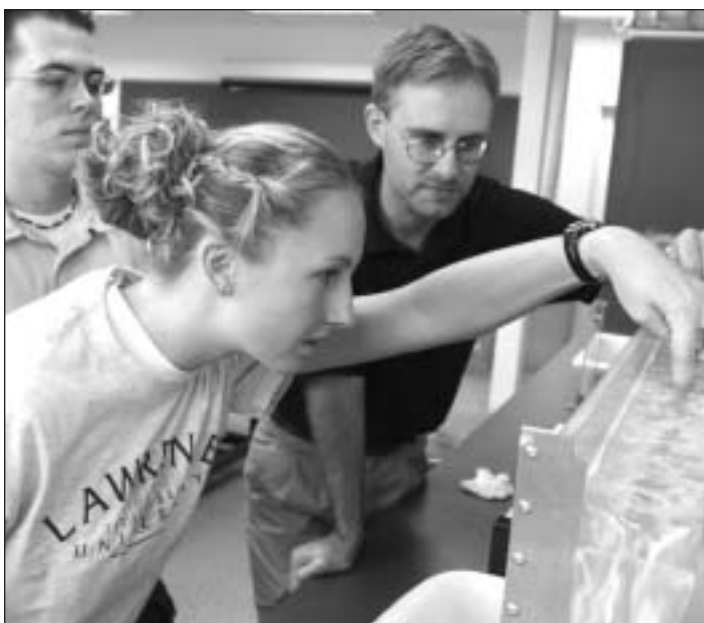
### FOURTH SEMESTER

COM2103	Tech & Prof Comm	3
MCS2023	Statistical Meth*	3
TME2143	Materials I	3
9		

### SIXTH SEMESTER

TME2033	Mech of Materials	3
TIE2093	Metrol & Qual Ctrl	3
TIE2163	Engr Econ & Acct	3
9		

\*or Applied Differential Equations (MCS2323)



**ASSOCIATE OF SCIENCE IN  
COMMUNICATIONS ENGINEERING TECHNOLOGY**

Total Semester credit hours: 65

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	COM1103	English Comp	3
MCS1113	Tech Math 1	3	MCS1123	Tech Math 2	3
MCS1023	Tech Comp Appl	3	PHY1063	Tech Phys 1	3
SSC2303	Basic Economics	3	PHY1100	Tech Phys Lab 1	0
		10			9
THIRD SEMESTER			FOURTH SEMESTER		
MCS2313	Tech Calc	3	MCS2323	Applied Diff Eq*	3
PHY1083	Tech Phys 2	3	TEE2013	Circuits 2	3
PHY1011	Tech Phys Lab 2	1	TEE2033	Electronics 1	3
TEE1023	Circuits 1	3			
		10			9
FIFTH SEMESTER			SIXTH SEMESTER		
COM2103	Tech & Prof Comm	3	TEE2093	Electronics 3	3
TEE2053	Electronics 2	3	TEE2123	Microprocessors	3
TEE2073	Electrical Drawing	3	TEE2163	Elect Communication	3
		9			9
SEVENTH SEMESTER					
TEE2163	Electronic Comm	3			
TEE2183	Industrial Electron	3			
TEE2226	Tel/Rad Fac Eng Mgt	3	*or Statistical Methods (MCS2023)		
		9			

**ASSOCIATE OF SCIENCE IN  
MECHANICAL ENGINEERING TECHNOLOGY**

Total Semester credit hours: 65

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. Hrs.	COURSE No.	SUBJECT	CR. Hrs.
COM1001	University Seminar	1	COM1103	English Comp	3
MCS1023	Tech Comp Appl	3	MCS1123	Tech Math 2	3
MCS1113	Tech Math 1	3	PHY1063	Tech Phys 1	3
TME1023	Tech Graphics	3	PHY1100	Tech Phys Lab 1	0
		10			9
THIRD SEMESTER			FOURTH SEMESTER		
SSC2303	Basic Economics	3	COM2103	Tech & Prof Comm	3
MSC2313	Tech Calc	3	MCS2323	Applied Diff Eq*	3
PHY1083	Tech Phys 2	3	TME2013	Statics	3
PHY1101	Tech Phys Lab 2	1			
		10			9
FIFTH SEMESTER			SIXTH SEMESTER		
TME2033	Mech of Matls	3	TIE2063	Mfg Processes 1	3
TME2053	Dynamics	3	TME2123	Fluids	3
TME2073	Thermodynamics	3	TME2143	Materials 1	3
		9			9
SEVENTH SEMESTER					
TEE2173	Automatic Ctrl Sys	3			
TME2163	Computer Graphics	3			
TME2213	Mechanical Design	3	*or Statistical Methods (MCS2023)		
		9			

**ENGINEERING TECHNOLOGY ADVISOR:** Contact the Technology Department, ext. 2060, room E179, for your assigned faculty advisor.

**ASSOCIATE OF ELECTRICAL CONTRACTING TECHNOLOGY**

Total Semester credit hours: 61

FIRST SEMESTER		SECOND SEMESTER	
COURSE No.	SUBJECT	COURSE No.	SUBJECT
COM1001	University Seminar	COM2103	Tech & Prof Com
MCS1023	Tech Comp Appl	MCS1123	Tech Math 2
COM1103	English Comp	HRM3013	Organiz Behavior
THIRD SEMESTER		FOURTH SEMESTER	
TEE3103	DC/AC Circuits	SSC2033	Princ of Economics
HRM4013	Emp/Mgt Rel	TEC2313	Elect Power Contr
ACC2013	Intro to Acct	TEC2343	Nat Elect Code
FIFTH SEMESTER		SIXTH SEMESTER	
TEC2373	Indust Co-op 1	TEC2383	Indust Co-op2
TEC2333	Acct for Elect Contr	TEC2353	Est Elect Contr
TEC2323	Elect Dr & Specs	TIE2103	Proj Mgmt
SEVENTH SEMESTER			
TEC2363	Elect Capstone Exp		
TEC2363	Elect Const Bid Pro		

**COURSES COMMON TO ALL ASSOCIATE DEGREE PROGRAMS**

**COMMUNICATIONS**

COURSE No.	SUBJECT
COM1001	University Seminar
COM1103	English Composition
COM2103	Technical and Professional Communication
<b>Total Communications Credits: 7</b>	

**MATHEMATICS**

COURSE No.	SUBJECT
MCS1113	Technical Mathematics 1
MCS1123	Technical Mathematics 2
MCS2313	Technical Calculus
MCS2023	Statistical Methods or MCS2323 Differential Equations
MCS1023	Technical Computer Applications
<b>Total Mathematics Credits: 15</b>	

**NATURAL SCIENCE**

COURSE No.	SUBJECT
PHY1063	Technical Physics 1
PHY1100	Technical Physics Laboratory 1
PHY1083	Technical Physics 2
PHY1101	Technical Physics Laboratory 2
<b>Total Natural Science Credits: 7</b>	

**SOCIAL SCIENCES**

COURSE No.	SUBJECT
SSC2303	Basic Economics
<b>Total Social Science Credits: 3</b>	

## COURSE SCHEDULE FOR CONSTRUCTION ENGINEERING TECHNOLOGY

### FALL OFFERINGS

#### COURSE

#### No. SUBJECT

TCE1023	Architectural Graphics**
TCE2013	Construction Tech 1**
TCE2073	Surveying
TIE2123	Project Management
TCE2093	Structures**

### SPRING OFFERINGS

TME2013	Statics
TME2033	Mech of Materials
TCE2033	Soils*
TCE2053	Construction Tech 2*
TCE2123	Estimating**
TCE2143	Specs & Regs**

## COURSE SCHEDULE FOR COMMUNICATIONS ENGINEERING TECHNOLOGY

TEE1023	Circuits 1**	TEE2013	Circuits 2*
TEE2053	Electronics 2*	TEE2033	Electronics 1*
TEE2073	Electrical Drawing*	TEE2093	Electronics 3**
TEE2163	Electronic Comm**	TEE2123	Microprocessors**
TEE2183	Industrial Elect**	TEE2143	Tel/Rad Fac Eng Oper
TEE2143	Tel/Rad Fac Eng Oper		

## COURSE SCHEDULE FOR MANUFACTURING ENGINEERING TECHNOLOGY

TME1023	Technical Graphics*	TME2143	Materials 1
TME2013	Statics	TME2033	Mech of Materials
TIE2063	Manu Processes 1	TIE2093	Metrology & QC
TIE2013	Prod & Work Meas	TIE2163	Engr Econ & Acct
TEE2173	Auto Control Syst	TIE2153	Manu Processes 2**
TIE2123	Project Management		

## COURSE SCHEDULE FOR MECHANICAL ENGINEERING TECHNOLOGY

TME1023	Technical Graphics*	TME2013	Statics
TME2033	Mech of Materials	TIE2063	Manu Processes 1
TME2053	Dynamics	TME2123	Fluids
TME2073	Thermodynamics	TME2143	Materials 1
TEE2173	Auto Control Syst		
TME2163	Computer Graphics		
TME2213	Mechanical Design		

\* Generally offered in odd years.

\*\* Generally offered in even years.

## BACHELOR OF SCIENCE IN ENGINEERING TECHNOLOGY (B.S.E.T.)

Total Semester credit hours: 125  
(including the associate degree or diploma)

The B.S.E.T. degree is designed as a degree completion program. It is for students who already hold an associate degree or an Ontario college diploma in a Lawrence Tech approved technical discipline. Completion of the degree program requires a total of 125 credit hours; including transfer credit and completion of the following requirements and electives.

27 to 33 credit hours of technical specialty (from the associate degree or diploma program).

Students must complete the following Lawrence Tech courses or their equivalent. (Equivalent classes are evaluated and transferred into the program during the admission process.)

### MATH AND COMPUTER SCIENCE (18 credit hours)

COURSE No.	SUBJECT
MCS1023	Technical Computer Applications
MCS1113	Tech Math 1
MCS1123	Tech Math 2
MCS2313	Tech Calculus
MCS2323	Applied Differential Equations
MCS2023	Statistical Methods

### NATURAL SCIENCE (11 credit hours)

PHY1063	Tech Physics 1
PHY1100	Tech Physics 1 Lab
PHY1083	Tech Physics 2
PHY1101	Tech Physics 2 Lab
CHM3144	Fundamentals of Chemistry

### COMMUNICATIONS (7 credit hours)

COM1001	University Seminar
COM1103	English Composition
COM2103	Technical and Professional Communication

### LANGUAGE AND LITERATURE (6 credit hours)

LLT2213	World Masterpieces 1
LLT1223	World Masterpieces 2

### SOCIAL SCIENCES (9 credit hours)

SSC2303	Basic Economics
SSC2413	Foundations of the American Experience
SSC2423	Development of the American Experience

### JUNIOR/SENIOR ELECTIVE (3 credit hours)

LLT3XX3 or LLT4XX3 or SSC3XX3 or SSC4XX3

### TECHNICAL CORE (29 credit hours)

HRM4013	Empl Mgt Relations
MGT2203	Mgt and Supervision
TEE3103	DC/AC Circuits
TIE2063	Manufacturing Processes

*Continued*

TIE2163	Engineering Economics and Accounting
TIE4115	Senior Project
TME2053	Dynamics (or TME3113 Engineering Mechanics for students who were not required to take Statics in the associate degree)
TME4103	Engineering Materials 2
TOM3113	Operations Management

### TECHNICAL ELECTIVES

The technical specialty must have 33 credit hours of work. It is common for certain technical specialty classes from the associate degree program (e.g., Manufacturing Processes) to apply to the technical core of the B.S.E.T. In which case, the credit transferred from the technical specialty must be replaced. Technical electives are also used to assure that the student has 33 credit hours in their technical specialty.

### Open Electives (3 to 9 credit hours)

Any Lawrence Tech class that is 1XXX or higher.

## ASSOCIATE OF ELECTRICAL CONTRACTING TECHNOLOGY

Total Semester credit hours: 61

### FIRST SEMESTER

COURSE No.	SUBJECT
COM1001	University Seminar
MCS1023	Tech Comp Appl
MCS1113	Tech Math 1
COM1103	English Comp

### SECOND SEMESTER

COM2103	Tech & Prof Comm
MCS1123	Tech Math 2
HRM3013	Organizational Behavior

### THIRD SEMESTER

TEE3103	DC/AC Circuits
HRM4013	Emp/Mgt Rel
ACC2013	Introduction to Accounting

### FOURTH SEMESTER

SSC2033	Principles of Economics
TEC2313	Electrical Power Contr.
TEC2324	National Electrical Code

### FIFTH SEMESTER

TEC2373	Industrial Co-op 1
TEC2333	Accounting for Elect Contr
TEC2323	Electrical Drawings & Specs

### SIXTH SEMESTER

TEC2383	Industrial Co-op 2
TEC2353	Estimating for Elect Contr
TIE2103	Project Management

### ELEVENTH SEMESTER

TEC2363	Elect Capstone Experience
TEC2363	Elect Const Bid Process

## ASSOCIATE OF SCIENCE IN MANUFACTURING ENGINEERING/TECHNOLOGY

For students in the Greenfield Coalition program only.

Total Semester credit hours: 69

### FIRST SEMESTER

COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
GCO0990	Orientation	0	GCF1013	Comp in Engr	3
GCF1101	Tech Graphics	1	GCM1022	Technical Math II	2
GCL1013	Engl Comp	3	GCT1211	Fnd of Measure	1
GCM1013	Technical Math I	3	GCC1012	Basic Chemistry	2
		7			8

### SECOND SEMESTER

COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
GCS2113	Mechanophys	3	GCS2141	Eng. Mech	1
GCM2114	Calculus	4	GCC2012	Chem/Matls Sci	2
GCF1133	Design Graphics	3	GCL1214	Psych/Soc	4
			GCM2413	Stat Methods	3
		10			10

### FIFTH SEMESTER

GCL2614	Comp Pol & Eco	4	GCT1112	Machine Proc	2
GCT2012	Engr Materials	2	GCT1221	Instrument	1
GCS2313	Electroscience	3	GCE2412	Manufact Plan	2
		9	GCL2013	Comm in Mfg	3
					8

### SEVENTH SEMESTER

GCT2314	Manufact Syst	4	GCT2511	Design Project	1
GCT2452	Ethics & Indus	2	GCE2261	Control Syst	1
GCT2212	Elect Machines	2	GCE2462	Engr Econ	2
GCS2211	Thermoscience	1	GCT2112	Manu Process	2
		9	GCT2182	Tool Design	2
					8

## MANUFACTURING ENGINEERING/TECHNOLOGY

(Greenfield Coalition) ADVISOR:

Sabah H. Abro, ext. 2069, VAX Username: SABAH, room E179





## DEPARTMENT OF CIVIL ENGINEERING

**Professors:**  
Nabil Grace (Chair)

**Associate Professors:**  
James Hanson  
Edmund Yuen

**Assistant Professors:**  
Donald D. Carpenter  
Elin Jensen  
Yuhong Wang

**Lecturers:**  
Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



### ECE1012 CIVIL ENGINEERING PERSPECTIVES

*Prerequisite: High school trigonometry, MCS0093 or permission of the instructor.* Introduction to the scope of civil engineering and the engineer's role in society. Professional issues including ethics, sustainable development, teamwork, design, and the history of the profession. Use of computers, and presentation of data. Lect. 2 hrs., 2 hours credit

### ECE1013 SURVEYING AND LAND MEASUREMENT

*Prerequisite: MCS1414.* Introduction to the theory and practice of land surveying and measurements; leveling, traversing, profiles, contours, drafting, data collection and computation; earthwork; description, care and use of instruments; and the layout of buildings, utilities, and routes. Lect. 2 hrs., Lab. 3 hrs., Lab fee. 3 hours credit

### ECE1101 CIVIL ENGINEERING COMPUTER GRAPHICS LAB

*Prerequisite: 0.* Introduction to the use of computers as a tool for engineering graphics. Use of AutoCAD and a basic introduction to the use of AutoDesk Land Development tools are emphasized. Lect. 0 hr., Lab. 2 hrs., Lab fee. 1 hrs. credit

### ECE1102 CIVIL ENGINEERING COMPUTER APPLICATION LAB

*Prerequisite: MCS1414, or permission of instructor.* Introduction to the use of computers as a tool for solving problems. Use of spreadsheets and mathematical analysis programs are emphasized. Lect. 1 hr., Lab 1 hr. Lab fee, 2 hrs. credit.

### ECE1413 CE MATERIALS

*Co-requisite: ECE1103 or permission of instructor.* Introduction to the analysis and use of civil engineering materials including concrete, asphalt, timber, composites, and metal structural materials. Laboratories include student-designed experiments. Lect. 2 hrs., Lab. 2 hrs. Lab fee. 3 hrs. credit

### ECE3213 CONSTRUCTION ENGINEERING

*Prerequisite: ECE1413.* Introduction to construction engineering, including construction methods, materials, and equipment. Factors affecting construction activities are examined, including costs, financing, labor relations, environmental regulations, permitting, and quality control. The relationship among owners, designers, contractors, and users. A thorough review of federal and state safety regulations. Lect. 3 hrs. 3 hours credit

### ECE3324 ENVIRONMENTAL ENGINEERING 1

*Prerequisites: CHM1213 and ECE3523.* Environmental quality objectives, standards and regulations, basic concepts of water purification; drinking water quality standards and the design of unit operations and processes in water treatment. Water plant waste management. Water quality management in rivers and lakes. Lect. 3 hrs., Lab. 2 hrs., Lab fee. 4 hours credit

### ECE3424 GEOTECHNICAL ENGINEERING

*Prerequisite: EME3013.* Soil origin and formation; physical properties of soils, soil composition and identification; permeability and effective stresses; soil compaction; consolidation and settlement of soils; shear strength; and bearing capacity. Lect. 3 hrs., Lab. 2 hrs., Lab fee. 4 hours credit

### ECE3523

#### HYDROMECHANICS

*Prerequisite: EGE2013.* Hydrostatics; application of principles of conservation of mass, energy and momentum; dimensional analysis and modeling; pipe flow; surface and form drag; irrotational flow and numerical techniques. Lect. 3 hrs. 3 hours credit

### ECE3723 THEORY OF STRUCTURES

*Prerequisite: ECE3013.* Calculations of reactions, and shear and bending moment in beams and frames; analysis of trusses by methods of sections and joints; deflection calculations; influence lines and moving loads for beams and trusses; introduction to statically indeterminate structures; computer applications. Lect. 3 hrs. 3 hours credit

### ECE3823 TRANSPORTATION ENGINEERING

*Prerequisites: EGE3012 and MCS3403.* A systems approach to transportation for decision-making by the engineer. The five major modes of transportation are introduced to achieve modal balance for person and product transport. Evaluation of public transit for intra-urban travel. Elements for system design are identified, operational analysis and the coordinate use of modes emphasized. Lect. 3 hrs. 3 hours credit

### ECE4021 CE DESIGN PROJECT 1

*Prerequisite: Senior standing and permission of department chairman.* Introduction to Senior Design Project (see ECE4033). Oral and written reports required. Lab fee. 1 hour credit

**ECE4033 CE DESIGN PROJECT 2**

*Prerequisite: Senior standing and permission of department chairman.* Open-ended design problems for seniors, incorporating fundamentals learned in previous courses. The design process is emphasized from the establishment of objectives and analysis of alternative solutions to a final evaluation and recommendation. Oral and written reports required. Lab fee. 3 hours credit

**ECE4051 ETHICS AND PROFESSIONAL ISSUES**

*Prerequisite: Senior standing or permission of department chairman.* Selected topics in engineering ethics, history of civil engineering, sustainability, licensure. Oral and written reports required. Lect. 1 hr. 1 hour credit

**ECE4243 CIVIL ENGINEERING MANAGEMENT PRACTICES**

*Prerequisite: EGE3012.* Overview of business and management practices applied to organizations involved in civil engineering, including consulting design firms, construction contractors, private owners and government agencies. Budgeting, project programming revenue sources and company profitability. Organizational structures, and effective team-building methods. Oral and written communication skills are developed. Lect. 3 hrs. 3 hours credit

**ECE4263 COST ESTIMATING, BIDDING AND CONTRACTING**

*Prerequisite: ECE3012.* Procedures and methods to prepare quantity measurements, estimate labor and equipment productivities, obtain material costs, and develop comprehensive estimates for construction. The bidding process, including consideration of new approaches such as design-build and partnering. Standard

construction contract forms including unit-price, lump-sum, and cost-plus. Insurance, warranties, and bonding issues. Lect. 3 hrs. 3 hours credit

**ECE4343 ENVIRONMENTAL ENGINEERING 2**

*Prerequisite: ECE3324.* Waste water treatment, air pollution control and solid waste management; design of different unit operations and processes in waste water treatment. Characterization of municipal and industrial solid wastes; hazardous waste regulations. Design of landfill. Lect. 3 hrs. 3 hours credit

**ECE4363 ENVIRONMENTAL ENGINEERING DESIGN**

*Co-requisite: ECE4544.* Computer-aided design in environmental engineering systems including water resources and storm water management. Development of surface and groundwater sources. Design, construction, and maintenance of water distribution systems and sanitary and storm water collection systems. Lect. 3 hrs. 3 hours credit

**ECE4443 FOUNDATION ENGINEERING**

*Prerequisite: ECE3424.* Site investigation techniques; design of retaining walls; cantilever and anchored sheet pile walls; strutted excavations; and shallow and deep foundations. Lect. 3 hrs. 3 hours credit

**ECE4544 HYDRAULIC ENGINEERING**

*Prerequisite: ECE3523.* Analysis and design of pipeline and open-channel systems; river engineering; computer modeling; hydraulic machinery. Lect. 3 hrs., Lab. 2 hrs., Lab fee. 4 hours credit

**ECE4563 HYDROLOGY**

*Prerequisites: ECE3523 and MCS3403.* Introduction to hydrologic cycle; stream gauging; unit hydrograph; flood routing; reservoir operation; groundwater hydraulics; application of probability and statistics to hydraulic design considerations; and drainage and culvert design. Lect. 3 hrs. 3 hours credit

**ECE4623 PROJECT PLANNING, DESIGN, AND SCHEDULING**

*Prerequisite: Senior standing or permission of department chair.* The planning and design of work flow processes for civil projects; models of network theory, Critical Path Method (CPM), Program Evaluation Review Technique (PERT), and Precedence Diagramming Method (PDM), as applied to project scheduling. Class design project required, as well as computer applications. Lect. 2 hrs., Lab. 2 hrs., Lab fee. 3 hours credit

**ECE4733 ADVANCED STRUCTURAL ANALYSIS**

*Prerequisite: ECE3723.* Analysis of indeterminate structures by moment-area theorems, slope deflection equations, moment distribution and conjugate beam methods; deflection calculations; use of influence lines; computer applications. Lect. 3 hrs. 3 hours credit

**ECE4743 CONCRETE DESIGN**

*Prerequisite: ECE3723.* Use of working stress and ultimate strength methods toward the analysis and design of reinforced concrete structural members such as slabs, beams, and columns; comprehensive design project; computer applications. Lect. 3 hrs. 3 hours credit

**ECE4753 STEEL DESIGN**

*Prerequisite: ECE3723.* Static investigation of structures. Analysis and design of steel members such as tension members, columns, beams, plate girders, composite girders, and trusses including riveted, welded, and high tensile bolted connections using LRFD and ASD methods; computer applications. Lect. 3 hrs. 3 hours credit

**ECE4761 STRUCTURAL DESIGN AND TESTING LAB**

*Co-requisite: ECE4743.* Applications of structural analysis and design to the actual designed and constructed structural members such as reinforced and prestressed concrete, steel, wood, and aluminum girders. Lab. 2 hrs. Lab fee. 1 hour credit

**ECE4843 HIGHWAY ENGINEERING**

*Prerequisites: ECE1013 and ECE3823.* Introduction to highway organization, administration, and finance; user cost and economic analysis of project alternatives. Study of driver and pedestrian behavior; analysis of vehicle maneuvers, geometrics, traffic flow for system design, capacity, signalization, and safety. Lect. 3 hrs. 3 hours credit

**ECE4911-3 DIRECTED STUDY IN CIVIL ENGINEERING**

*Prerequisite: Permission of department chair.* In-depth study of a particular civil engineering topic. Normally a written report required. Hours of credit designated by last digit in course number.

**ECE4921-3 SPECIAL TOPICS IN CIVIL ENGINEERING**

*Prerequisite: Senior standing or permission of department chair.* Material of a specialized nature that is of interest to both faculty and students. Hours of credit designated by last digit in course number.

**ECE5213 PROJECT MANAGEMENT TECHNIQUES**

*Prerequisite: Graduate standing or permission of department chair.*  
The wide range of management techniques in civil infrastructure projects. Focus on construction scheduling, budgeting, cash flow, and quality management. Current software used throughout. Actual civil infrastructure projects used include highway, airport, water and wastewater facilities.  
Lect. 3 hrs. 3 hours credit

**ECE5233 ADVANCED CONSTRUCTION TECHNIQUES AND METHODS**

*Prerequisite: Graduate standing or permission of department chair.*  
An in-depth evaluation of current and emerging construction techniques and methods that are designed to improve the constructability, performance and life-cycle costs of civil infrastructure projects. New materials, design approaches and construction techniques are investigated by examination of specific experiences in the construction industry.  
Lect. 3 hrs. 3 hours credit

**ECE5253 RISK MANAGEMENT AND PERSONNEL**

*Prerequisite: Graduate standing or permission of department chair.*  
The many risks and liabilities associated with construction, including safety and insurance issues. A detailed analysis of the human factor in construction, including allocation and utilization of personnel, recruitment and training. Labor relations and related contractual issues are evaluated. Lect. 3 hrs. 3 hours credit

**ECE5323 ENVIRONMENTAL CLEANUP**

*Prerequisite: ECE4343 or equivalent; Graduate standing or permission of department chair.*  
Remediation management at contaminated sites involving remedial

investigation/feasibility study process. Remedial investigation focuses on data collection and site characterization. Feasibility study emphasizes data analysis and decision making on applicable remedial technologies. Discussion of subsurface transport and fate of contaminants. Lect. 3 hrs. 3 hours credit

**ECE5343 ADVANCED ENVIRONMENTAL ENGINEERING**

*Prerequisite: ECE4343 or equivalent; Graduate standing or permission of department chair.*  
Recent advances in the design of unit operations in water and wastewater treatment plants. New developments in natural systems for waste management and treatment practices. Microcomputer applications. Lect. 3 hrs. 3 hours credit

**ECE5363 SURFACE WATER QUALITY MANAGEMENT**

*Prerequisite: ECE4343 or equivalent; Graduate standing or permission of department chair.*  
Management models in the cause-effect analysis of water quality in surface water bodies such as lakes, estuaries, bays, harbors, streams and rivers. Waste load allocation management strategies to reduce waste inputs to surface water bodies. Water quality modeling and control in the transport and fate analysis of contaminants in surface water. Lect. 3 hrs. 3 hours credit

**ECE5423 GEOENVIRONMENTAL ENGINEERING**

*Prerequisite: Graduate standing or permission of department chair.*  
Waste containment facilities design, construction and operation; including linear systems and geosynthetics, interaction of soil with chemicals, and transport of chemicals and water in soils. Lect. 3 hrs. 3 hours credit

**ECE5433 GROUND IMPROVEMENT METHODS FOR FOUNDATIONS**

*Prerequisites: ECE3424; Graduate standing or permission of department chair.*  
Practical and innovative design methods for ground improvement related to soft ground, deep foundations, slope stability, seismic activity, and geosynthetics. Combines investigation of case histories, current projects, design methodology, and geotechnical engineering theory. Lect. 3 hrs. 3 hours credit

**ECE5713 ANALYSIS AND DESIGN OF PRESTRESSED CONCRETE**

*Prerequisite: ECE4743 or equivalent; Graduate standing or permission of department chair.*  
Use of prestressed concrete in infrastructure applications: prestressing principles, analysis and design of pre- and post-tensioned systems, losses, flexure, shear, bond, camber and deflection, continuous prestressing, columns, and circular prestressing. Use of advanced composite materials such as prestressing strands to solve infrastructure problems. ACI and PCI prestressed concrete design manual discussed. Lect. 3 hrs. 3 hours credit

**ECE5723 ADVANCED ANALYSIS AND DESIGN OF STRUCTURES**

*Prerequisite: ECE4733 or equivalent; Graduate standing or permission of department chair.*  
A unified presentation of the entire field of structural analysis, including introduction to the analysis of indeterminate structures, force method analysis and applications, displacement method analysis and applications, analysis of shear walls, plastic analysis of continuous beams and frames, and concrete, steel and wood design topics. Lect. 3 hrs. 3 hours credit

**ECE5743 INTRODUCTION TO STRUCTURAL DYNAMICS**

*Prerequisite: ECE4733 or equivalent; Graduate standing or permission of department chair.*  
Practical analysis and design of real structures; basic theory and numerical analysis of one- and two-degree elastic systems, lumped-mass multi-degree systems; distributed mass and load, approximate design approach, earthquake analysis, and earthquake design. Lect. 3 hrs. 3 hours credit

**ECE5763 ADVANCED COMPOSITE MATERIALS AND THEIR USES IN STRUCTURES**

*Prerequisite: ECE3723 or equivalent; Graduate standing or permission of department chair.*  
Definitions, mechanical properties and durability of advanced composite materials. Protruded sections and fiber reinforced plastic (FRP) bars. Concrete structures reinforced with FRP bars; behavior and strength in bending and shear. Repairs and rehabilitation of structures. New applications and design concepts. Lect. 3 hrs. 3 hours credit

**ECE5923 SPECIAL TOPICS IN CIVIL ENGINEERING**

*Prerequisite: Graduate standing or permission of department chair.*  
Topic or topics of current interest in the field of civil engineering. Course content subject to change each time the course is offered. Lect. 3 hrs. 3 hours credit

**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

**Professors:**

H. Robert Farrah  
 Ronald C. Foster (chair)  
 Robert D. Hatch, emeritus  
 Richard R. Johnston  
 Richard S. Maslowski  
 Kelvin Shih  
 Lewis N. Walker

**Assistant Professor:**

Peter Csaszar

**Associate Professors:**

Lisa M. Anneberg  
 Michael J. Cloud  
 Nabil Hachem, emeritus  
 Mohammad H. Hassan  
 William B. Kolasa

**Lecturers:**

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster



**EEE1002 INTRODUCTION TO ELECTRICAL AND COMPUTER ENGINEERING**

*Co-requisite: MCS0093.* Survey of the scope of electrical and computer engineering and the engineer's role in society. Professional issues including ethics, sustainability and history of the profession will be covered. Basic electrical and computer engineering tools such as simulation, modeling, and other computing tools will be used. Lect. 2 hrs. 2 hours credit

**EEE2114 CIRCUITS I**

*Co-requisites: MCS2423, PHY2423.* Voltage current, power. Kirchoffs laws, Ohms law, resistance, independent and dependent sources, operational amplifiers. Formulation and solution of network equations, Mathcad, Spice, linearity and superposition,

Thevenins theorem, maximum power transfer. Capacitance, inductance, mutual inductance. Sinusoidal steady state analysis, AC power, three phase systems. Transfer functions, frequency response, Bode diagrams, filters. First order transient responses. Lect. 4 hrs. 4 hours credit

**EEE2111 CIRCUITS 1 LAB**

*Co-requisite: EEE2114.* Safety. Proper use of test equipment. Measurement of resistances, measurement of constant voltages and currents, instrument loading, error analysis. Design of voltage and current dividers, T and PI attenuators. Measurement of power, source resistance, Thevenin parameters. Op amps, dependent sources, wave-forms, first and second order transient circuits. Balanced bridges, strain gauges, thermistors, thermocouples. Lab. 2 hrs. 2 hours credit

**EEE2123 CIRCUITS AND ELECTRONICS**

*(For non-EE majors) Co-requisites: MCS2423, PHY2423.* Fundamental laws. Circuit parameters, elementary network theory. Forced and transient response, semi-conductor devices, electronic circuits, digital logic and counting circuits. Lect. 3 hrs. 3 hours credit

**EEE2211 DIGITAL ELECTRONICS LAB**

*Co-requisite: EEE2213.* Lab experiments dealing with the concepts from EEE2213, Digital Electronics. Experiments include studies of various logic gates, and the design of various combinational and sequential circuits. Lab. 2 hrs., Lab fee. 1 hour credit

**EEE2213 DIGITAL ELECTRONICS**

*Prerequisite: Junior standing.* Logic gates, minimization and design of combinational circuits, MSI and LSI circuits and applications, sequential circuit analysis and design. Lect. 3 hrs. 3 hours credit

**EEE3121 CIRCUITS 2 LAB**

*Prerequisite: EEE2111, Co-requisite: EEE3123.* Measurement of magnitude and phase of sinusoidal signals, measurement of magnitude and phase response as a function of frequency. Superposition, Thevenin, and Norton analyses in the frequency domain. Differentiators, integrators, constant current sources, transformers. Interface and filter design. Parasitic inductance, capacitance, and resistance. Lab 2 hrs. 1 hour credit

**EEE3123 CIRCUITS 2**

*Prerequisite: EEE2114.* Ramp, step, and impulse functions. Second order transient responses, differential equations, transfer functions, convolution, impulse response. Laplace transforms, Fourier analysis, two-port networks. Lect. 3 hrs. 3 hours credit

**EEE3153 ELECTRICAL MACHINES AND CONTROLS**

*(For non-EE majors) Prerequisite: EE2123.* Magnetic circuits, DC and AC machines, transformers, linear systems, models and equations, time and frequency response of control systems, root locus, Bode plots, stability, control system design methods, sinusoidal steady state, three phase systems. Lect. 3 hrs. 3 hours credit

**EEE3161 INTRODUCTION TO EE LABS**

*(For non-EE majors) Co-requisite: EEE3153.* Electrical and electronic measurements, op-amps, diodes and rectifier circuits, bipolar junction transistors, field effect transistors, amplifiers, digital electronics. Physical system modeling, satisfying design and performance criteria. Fundamentals of DC and AC machine operations. Lab 2 hrs. 1 hour credit

**EEE3221 ADVANCED DIGITAL ELECTRONICS LAB**

*Prerequisite: EEE2211, Co-requisite: EEE3223.* Laboratory experiments covering the principles studied in EEE3223. PLDs, I/O and peripheral circuitry, image processing, digital signal processing, and other related topics. Lab. 2 hrs., Lab fee. 1 hour credit

**EEE3223 ADVANCED DIGITAL ELECTRONICS**

*Prerequisite: EEE2213.* Implementation of state machines using programmable logic devices (PLDs), design of computer hardware and related I/O circuitry using hardware description language VHDL. Memory control unit, graphics and image processing, digital signal processing, bus interface circuitry, communication devices, peripheral hardware design, and industrial control applications. Lect. 3 hrs. 3 hours credit



**EEE3231 MICROPROCESSORS LAB**  
*Co-requisite: EEE3233.* Study and design of assembly language and programming, hardware emulation, clock design and interface, input/output and memory design and interface. Design of a turn-key microcomputer system. Lab. 2 hrs. *1 hour credit*

**EEE3233 MICROPROCESSORS**  
*Prerequisite: EEE2213, EEE2114.* Architecture, timing, instruction set, memory and input/output techniques for various microprocessors, design of a microcomputer system. Lect. 3 hrs. *3 hours credit*

**EEE3311 ELECTRONICS LAB**  
*Co-requisite: EEE3311.* Experiments on power supplies voltage regulators, transistor class A amplifiers, timers, simple operational circuits, active filters, sample and hold circuits are performed. Lab. 2 hrs., Lab fee. *1 hour credit*

**EEE3314 ELECTRONICS**  
*Prerequisite: EEE3123.* Study and design of passive and active semiconductor devices, circuits, operational amplifiers, voltage comparator circuits and non-linear circuits, design of power supplies, voltage regulators, and timers. Solid state semi-conductor materials and characteristics will be covered. Lect. 4 hrs. *4 hours credit*

**EEE3414 ELECTROMAGNETIC FIELDS AND WAVES**  
*Prerequisite: PHY2423.* Vector analysis. Electrostatics and magnetostatics in free space. Fields in the presence of engineering materials. Time-varying fields and Maxwells equations. Plane electromagnetic waves. Transmission line theory. Lect. 4 hrs. *4 hours credit*

**EEE3422 ADVANCED COMPUTER APPLICATION LAB**  
*Prerequisites: MCS3413, EEE3123, Co-requisite: EEE3313.* Computation techniques for electrical engineering, including matrix methods and solution of differential and integral equations. Application of specialized programs for solving engineering problems. Use of computer simulation techniques. Lect. 1 hr., Lab. 2 hrs. *2 hours credit*

**EEE3511 INTRODUCTION TO ELECTRICAL SYSTEMS LAB**  
*Co-requisite: EEE3513.* Electrical safety, measurement of single phase and three phase AC voltages, currents and power. Transformers, relays, torque, power, and rotational speed. Lab 2 hrs. *1 hour credit*

**EEE3513 INTRODUCTION TO ELECTRICAL SYSTEMS**  
*Prerequisite: EEE3123.* Phasors, single phase AC power, three phase systems, three phase power, magnetic circuits, relays, transformers. Fundamentals of rotating machinery. National Electric Code, short circuit current calculations, fuses and circuit breakers. Lect. 3 hrs. *3 hours credit*

**EEE4131 ELECTRICAL MACHINERY LAB**  
*Co-requisite: EEE4133.* Electrical and rotating machine safety, measurement of current, power, torque, and efficiency of DC machines, and synchronous machines. Determination of machine model parameters, chopper control of electric machines. Lab. 2 hrs. *1 hour credit*

**EEE4133 ELECTRICAL MACHINERY**  
*Prerequisite: EEE3513, Co-requisite: EEE4131.* Steady state and dynamic modeling of DC machines, induction machines, and synchronous machines. Power, torque, loss mechanisms, efficiency. Power electronic control of electric machinery. Lect. 3 hrs. *3 hours credit*

**EEE4151 ELECTRIC DRIVES LAB**  
*Co-requisite: EEE4153.* Electrical safety, measurement of current, power torque, and efficiency of DC, induction, and synchronous machines. Determination of model parameters, chopper control of DC and AC motors. Lab. 2 hrs. *1 hour credit*

**EEE4153 ELECTRIC DRIVES**  
*Prerequisite: EEE3513, Co-requisite: EEE4151.* Electronic control, and both steady-state and dynamic modeling of DC motors and generators, induction motors, and synchronous motors and generators. Power, torque, loss mechanisms, and efficiency. Lect. 3 hrs. *3 hours credit*

**EEE4231 MICROPROCESSORS 2 LAB**  
*Prerequisite: EEE3231, Co-requisite: EEE4233.* Study and design of hardware aspects of computer technology, including memory, interface, and I/O circuitry, interrupt and exception protocols. The lab will include a major student project incorporating the principles studies in EEE4233. Lab. 2 hrs. *1 hour credit*

**EEE4233 MICROPROCESSORS 2**  
*Prerequisite: EEE3233, Co-requisite: EEE4231.* A continuation of Microprocessors 1, emphasizing the hardware aspects of computer technology. Specific architectures studied include advanced Intel and Motorola processors, and various memory and I/O devices and strategies. Lect. 3 hrs. *3 hours credit*

**EEE4241 EMBEDDED SYSTEMS LAB**  
*Co-requisite: EEE4243.* Program development using a microcontroller evaluation module board (EVB); design of experiments using an EVB development tool; various I/O interfacing design examples. Term design project. Lab 2 hrs. *1 hour credit*

**EEE4243 EMBEDDED SYSTEMS**  
*Prerequisite: EEE3233.* Utilization of microcontrollers in design of instruments and embedded controllers. Description of on-chip resources, programming framework, parallel I/O, main timer and real-time interrupt, pulse accumulator, A/D converter and serial communication subsystems. Interfacing techniques. Lect. 3 hrs. *3 hours credit*

**EEE4253 COMPUTER ARCHITECTURE I**  
*Prerequisite: EEE3233.* Analysis of state machines. CPU design with consideration for data flow, I/O, and ALU. Basic computer architecture classifications. Memory systems including memory cache and virtual memory design. Pipeline design techniques. RISC and CISC computer architectures. Selected 8, 16, 32, and 64 bit microprocessor chips. Lect. 3 hrs. *3 hours credit*

**EEE4261 COMPUTER NETWORKING LABORATORY**  
*Co-requisite: EEE4263.* Local asynchronous communication; extending LANs-modems, repeaters, bridges, switches; packer switches; service paradigms; protocols and layering; binding protocol addresses; networking management software; network security, filtering, firewalls. Lab. 2 hrs. *1 hour credit*

**EEE4263 COMPUTER NETWORKING**  
*Prerequisites: EEE2114, EEE3223.* Local asynchronous communication; extending LANs-modems, repeaters, bridges; switches; packet switches; service paradigms; protocols and layering; binding protocol address; network management software; network security-filtering and firewalls. Course contains lecture and laboratory sections. Lect. 3 hrs. *3 hours credit*

**EEE4273 REAL TIME SYSTEMS**

*Prerequisites: EEE3233.* Analysis of real time systems from both a hardware and software point of view. Timing and hardware constraints. Study of task assignments scheduling algorithms; resource allocation, and reliability and fault tolerance. Introduction to various real time operating systems. Examples are given of typical real time system applications. Lect. 3 hrs. 3 hours credit

**EEE4321 ADVANCED ELECTRONICS LAB**

*Co-requisite: EEE4323.* Using simulation programs to solve circuit problems. Circuit analysis using non-ideal Op-Amps; precision rectifier circuits, timer circuits; designing wave generators; frequency to voltage converters, sample and hold circuits; active filters. Lab 2 hrs. 1 hour credit

**EEE4323 ADVANCED ELECTRONICS**

*Prerequisite: EEE3314.* Advanced power supply design and switch mode regulator. Switch capacitor design. Phase locked loop design and applications. Instrumentation amplifier and isolation amplifier. Frequency to voltage converter and voltage to frequency converter. Voltage to current converter and 4-20mA current loop. Lect. 3 hrs. 3 hours credit

**EEE4333 AUTOMOTIVE ELECTRONICS**

*Prerequisites: EEE3233, EEE3314, EEE4513.* Introduction to principles of automotive electronics. Basic function of automotive engine and vehicles. Vehicle power supply. Electrical, temperature, environmental requirements. Electronic ignition. Electronic engine and transmission management, including open and closed loop control design, diagnostics.

Vehicle controls: system concept, sensors, actuators, control design, diagnostics. Instrumentation principles. Example hardware systems. Introduction to electric vehicles. Lect. 3 hrs. 3 hours credit

**EEE4343 ELECTRONIC NOISE REDUCTION**

*Prerequisite: EEE3314.* Electromagnetic compatibility design techniques, interference problems, grounding and other noise reduction techniques, passive components, shielding, intrinsic and active noise sources, digital circuit noise and radiation. Lect. 3 hrs. 3 hours credit

**EEE4423 COMMUNICATION SYSTEMS**

*Prerequisites: MCS3403, EEE3123.* Fourier series and transforms, random variables, noise analysis. Amplitude and frequency modulation, digital pulse code modulation. Multi-plexing techniques. Channel bandwidth limitations, and channel coding techniques. Spread spectrum systems. System designs for telecommunications, link budgets. Lect. 3 hrs. 3 hours credit

**EEE4433 ANTENNAS AND RADIATION**

*Prerequisite: EEE3414.* Review of Maxwells equations. Electro-magnetic formulation for radiating systems. Antenna definitions and terminology. Patterns of various point source models. Point source arrays. Thin wire, aperture, reflector, and broadband antennas. Introduction to radio wave propagation, communication links and radar. Lect. 3 hrs. 3 hours credit

**EEE4511 CONTROL SYSTEMS LAB**

*Co-requisite: EEE4513.* Application of control system design and techniques. Physical system parameter determination, prediction of performance, interpreting and satisfying design criteria, implementation of compensator networks. Lab. 2 hrs. 1 hour credit

**EEE4513 CONTROL SYSTEMS**

*Prerequisites: EEE3123 and EEE3314.* Convolution, linear systems models and equations, block diagrams, signal flow graphs, time and frequency response of systems, root locus, Bode plots, Nyquist plots, stability, compensators, control system design methods, computer simulations. Lect. 3 hrs. 3 hours credit

**EEE4541 PROCESS CONTROL LAB**

*Co-requisite: EEE4543.* Simulation of industrial process control using programmable logic controllers, simulation software, and scale model systems. Lab. 2 hrs. 1 hour credit

**EEE4543 PROCESS CONTROL**

*Prerequisites: EEE3233, EEE4513, Co-requisite: EEE4541.* Design and implementation of industrial controllers using programmable logic controllers. Relay ladder logic, electrical schematic symbols, programmable logic controllers, interface circuitry, operator safety, state machines, Grafset, PID controllers. Lect. 3 hrs. 3 hours credit

**EEE4583 INSTRUMENTATION AND SENSOR TECHNOLOGY**

*Prerequisite: EEE3314.* Analyze and design signal conditioning circuits for measuring temperature, force, pressure, flow, and fluid level. Interfacing techniques such as voltage to frequency. Converter, A to D, 4-20mH current loop and multiplexing. Lect. 3 hrs. 3 hours credit

**EEE4613 SOLID STATE TECHNOLOGY**

*Prerequisites: EEE3314, EEE3414.* Semiconductor materials and characteristics. Energy band diagrams. Conduction principles. Diodes, transistors, FETS, MOSFETS, memory.

Manufacturing techniques for ICs. Design of IC chip layouts. Future trends in microminiaturization. Lect. 3 hrs. 3 hours credit

**EEE4713 OPTOELECTRONICS**

*Prerequisites: EEE3314, EEE3414.* Optical beams, laser fundamentals, laser systems, semiconductor structure, LED's, injection lasers, thermal detectors, optical detectors, optical beam deflection and modulation, integrated optics, optical fiber systems and components. Emphasis on optical fiber systems. Lect. 3 hrs. 3 hours credit

**EEE4811 EE PROJECTS 1**

*Prerequisite: Senior standing.* Principles of project design, including project specifications, planning, setting milestones, and project management. Students working in groups must complete the design phase of a major design project. Projects incorporate the practices and principles learned in the EE curriculum and outlined in the IEEE professional criteria. Projects will be entrepreneurial in nature with business, marketing, and management plans as appropriate. Students in each of the project groups must present an oral and written project proposal early in the term, a mid-term progress report, and a formal written and oral presentation at the end of the term. 1 hour credit

**EEE4821 INTRODUCTION TO ECE PROJECTS**

*Prerequisites: Junior standing.* The first course in the ECE Senior Projects sequence. Report and oral presentation techniques. Project planning. Circuit design and debugging. Printed circuit board techniques. Review of the IEEE professional engineering criteria. Lect. 1 hr. 1 hour credit

## EEE4822 EE PROJECTS 2

*Prerequisite: EEE4812.*  
Continuation of EEE4812, Projects 1, and includes the construction and testing phase of the design project. Projects incorporate the practices and principles learned in the EE curriculum and outlined in the IEEE professional criteria. Projects will be entrepreneurial in nature with business, marketing, and management plans as appropriate. Students are required to give a mid-term oral progress report, and a final formal written and oral presentation, and are expected to display their projects during the annual Lawrence Tech Open House. *2 hours credit*

## EEE4831 COMPUTER ENGINEERING PROJECTS 1

*Prerequisite: Senior standing.*  
Principles of project design, including project specifications, planning, setting milestones, and project management. Students, working in groups, must complete the design phase of a major design project. Projects incorporate the practices and principles learned in the Computer Engineering curriculum and outlined in the IEEE professional criteria. Each project should include a design that incorporates both computer hardware and software principles. Projects will be entrepreneurial in nature with business, marketing, and management plans as appropriate. Students in each of the groups must present an oral and written project proposal early in the term, a mid-term progress report, and a formal written and oral presentation at the end of the term. Each team works closely with a faculty advisor. *1 hour credit*

## EEE4842 COMPUTER ENGINEERING PROJECTS 2

*Prerequisite: EEE4832.*  
Continuation of EEE4832, Computer Engineering Projects 1, and includes the construction and testing phase of the design project. Each project should include a

design that incorporates both computer hardware and software principles. Projects will be entrepreneurial in nature with business, marketing, and management plans as appropriate. Students are required to give a mid-term oral progress report, and a final formal written and oral presentation, and are expected to display their projects during the Lawrence Tech Open House. *2 hours credit*

## EEE4851 SENIOR SEMINAR

*Prerequisite: Senior standing.*  
Technical and professional topics including engineering design techniques, engineering ethics, history of electrical and computer engineering, careers in electrical and computer engineering, and professional practice. Speakers with industry, university, and government experience present the lecture material. Mandatory lecture attendance and a written report required. Lect. 1 hr. *1 hour credit*

## EEE4911-3 DIRECTED STUDY IN ELECTRICAL ENGINEERING

*Prerequisites: Senior standing and permission of the department chair.* In-depth study of a particular electrical engineering topic. An approval form outlining the proposed study must be submitted and approved prior to course registration. (Hours of credit designated by last digit in course number.)

## EEE4921-3 SPECIAL TOPICS IN ELECTRICAL ENGINEERING

*Prerequisite: Undergraduate standing.* Material of a specialized nature not covered in other courses that is of interest to both faculty and students. (Hours of credit designated by last digit in course number.)

## EEE5114 ENGINEERING ANALYSIS

*Prerequisite: Graduate standing or department approval.*  
Numerical methods for algebraic and differential equations. Matrix solution, eigenvalues and eigenvectors, diagonalization, uncoupling, non-linear systems. Change of coordinates, orthogonalization, matrix factorization, approximation and interpolation, Householder reflections. Lect. 4 hrs. *4 hours credit*

## EEE5144 POWER DISTRIBUTION SYSTEMS

*Prerequisite: Graduate standing or department approval.* A.C. power, three-phase systems, per-unit analysis, one-line diagrams. Transformers, synchronous machines, salient pole machines,

transient effects. Transmission line inductance, transmission line capacitance, transmission line models. The admittance model, the impedance model, the load-low problem. Lect. 4 hrs. *4 hours credit*

## EEE5204 ADVANCED COMPUTER ARCHITECTURE

*Prerequisite: Graduate standing or department approval.* Studies of contemporary computer organizations covering early systems, CPU design, instruction sets, control, processors, busses, ALUs, memory, I/O interfaces, connection networks, virtual memory, pipelined computers, multiprocessors, and case studies. Lect. 4 hrs. *4 hours credit*





**EEE5264 ADVANCED MICROPROCESSORS**

*Prerequisite: Graduate standing or department approval.* Design and applications microcomputers. Topics include: 16 bit vs. 32 bit processor organization, controller design, I/O port interfacing, memory structure, addressing methods, keyboard and display interface, and hardware arithmetic functions. Design and interface considerations for peripheral and interrupt devices. Lect. 4 hrs. 4 hours credit

**EEE5274 IMAGE PROCESSING**

*Prerequisite: Graduate standing or department approval.* Image understanding, image enhancement and restoration, image encoding design, feature extraction, image interpretation, object recognition and applications. Lect. 4 hrs. 4 hours credit

**EEE5284 PARALLEL ARCHITECTURES**

*Prerequisite: Graduate standing or department approval.* In-depth study of the design, engineering, and evaluation of modern parallel computers. Fundamental design, naming, synchronization, latency, and bandwidth. Architectural evolution and technological driving forces. Parallel programming models and communication primitives. Lect. 4 hrs. 4 hours credit

**EEE5324 NETWORK SYNTHESIS**

*Prerequisite: Graduate standing or department approval.* Network functions, filters, normalization, magnitude approximation, phase approximation, time-domain considerations, sensitivity. Properties and synthesis of LC driving point functions, properties of transfer functions, synthesis of transfer functions. Single amplifier filters, op-amp parasitics, state-variable filters, universal active filter, bi-quadratic filters, active networks for direct realization, switched capacitor filters. Lect. 4 hrs. 4 hours credit

**EEE5354 ANALOG INTEGRATED CIRCUIT DESIGN**

*Prerequisite: Graduate standing or department approval.* Analysis and design of monolithic operational amplifiers and wide-band amplifiers. Methods of achieving wide-band amplification, gain band-width considerations, analysis of noise, and low-noise design. Precision passive elements; analog switches, amplifiers, and comparators; parallel analog-to-digital converters. Switched capacitor and CCD filters, applications, and case studies. Lect. 4 hrs. 4 hours credit

**EEE5364 COMPUTER NETWORKING**

*Prerequisite: Graduate standing or department approval.* Advanced treatment of the following: OSI model, TCP/IP encoding and modulation, transmission and signals of digital data; interfaces and modems, transmission media, multiplexing, error detection and correction, data link control and protocols, LANS/MANS/VLANS/VPNS, switching. point-to-point protocol (PPP), network security, hardware including: ISDN; X.25; frame relay; ATM; SONET/SDH. Lect. 4 hrs. 4 hours credit

**EEE5444 DIGITAL COMMUNICATIONS**

*Prerequisite: Graduate standing or department approval.* Design of baseband and passband digital communication systems. Modulation techniques including PAM, QAM, PSK, FSK, and spread spectrum. Optimal demodulation techniques and their performance. Analysis evaluation, and design of integrated circuits for communication applications. Lect. 4 hrs. 4 hours credit

**EEE5524 MODERN CONTROL SYSTEMS**

*Prerequisite: Graduate standing or department approval.* State space realization of transfer functions, canonical forma, fundamental and state transition matrices, introduction to optimal control, quadratic performance indices, observers, Liapunov stability theory. Lect. 4 hrs. 4 hours credit

**EEE5534 DIGITAL CONTROL SYSTEMS**

*Prerequisite: Graduate standing or department approval.* Discrete time mathematics, Z transforms, sampling rates, zero and first order hold, time delays, system stability, continuous and discrete time system interfacing, computer control implementation concepts, state space realization. Lect. 4 hrs. 4 hours credit

**EEE5554 APPLICATIONS OF ARTIFICIAL INTELLIGENCE**

*Prerequisite: Graduate standing or department approval.* System design using AI methods; AI programming languages, intelligent vision and imaging systems, data base search methods, logic and deduction using predicate calculus. Expert system design with applications to robots. Lect. 4 hrs. 4 hours credit

**EEE5564 INTERFACING AND CONTROL OF ROBOTS**

*Prerequisite: Graduate standing or department approval.* Shaft encoders, actuators, robot coordinate systems, kinematics, path control, sensors, robot vision, design of robot interfaces. Lect. 4 hrs. 4 hours credit

**EEE5614 COMPUTER-AIDED DESIGN OF INTEGRATED CIRCUITS**

*Prerequisite: Graduate standing or department approval.* Design, simulation, layout techniques, synthesis, verification, and testing of digital integrated circuits using hardware description languages. FPGA design and timing verification. Lect. 4 hrs. 4 hours credit

**EEE5624 VLSI DESIGN**

*Prerequisite: Graduate standing or department approval.* Specification of MOSFETS and CMOS, IC fabrication, mask design, semi-custom and full-custom designs, application-specific integrated circuit design, and system design. Specific integrated circuit design, design rules, and case studies. Lect. 4 hrs. 4 hours credit

**EEE5634 OPTICAL SYSTEMS ENGINEERING**

*Prerequisite: Graduate standing or department approval.* Maxwell's equations, geometrical and physical optics, optical components. Gaussian beams. Fourier transforming properties of lenses. Properties of Lasers, LEDs, and detectors. Design of emitter and detector circuits. Design of free space and optical fiber systems. Lect. 4 hrs. 4 hours credit

**EEE5654 DIGITAL SIGNAL PROCESSING**

*Prerequisite: Graduate standing or department approval.* Sampling theory and sampling hardware, Z transform, architecture of VLSI digital signal processors. Design and implementation of real time polynomial, FIR, IIR, and adaptive filters, spectral analysis with FFT. Design of DSP application in communication and digital control. Lect. 4 hrs. 4 hours credit

**EEE5784 COMMUNICATION CIRCUITS**

*Prerequisite: Graduate standing or department approval.* Transmitters and receivers. Small-signal, high-frequency, and power amplifiers. Network noise and distortion. Hybrid and transmission-line transformers. Oscillators. Phase-locked loops. Modulators and demodulators. Lect. 4 hrs. 4 hours credit



## DEPARTMENT OF ENGINEERING TECHNOLOGY

**Associate Professors:**  
Donald F. Condit  
Stanley F. Harris  
William L. White (chair)

**College Professor:**  
Sabah H. Abro

**Lecturers:**  
Serhat Eren

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise, and are listed in the faculty roster.



### TCE1023 ARCHITECTURAL GRAPHICS

*Prerequisite:* MCS1023, *Co-require:* TCE2013. Introduction to architectural graphics, lettering, geometric construction, orthographic projection, sectioning, auxiliary views, isometric and pictorial drawings, freehand sketching, basic residential planning and light construction principles. Detailing of both timber and masonry structures; wood beams, fasteners, plywood construction systems, and lumber framing; construction details for stone, brick and concrete masonry units; panelized masonry construction; masonry wall reinforcing and masonry treatments. Drawings are made. Introduction to CAD. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

### TCE2013 CONSTRUCTION TECHNIQUES 1

*Prerequisite:* 0. The function, quality and cost of various building materials and methods used in the construction of residential, commercial, industrial, and other

constructions including churches, hospitals and schools. Materials include wood, concrete, masonry, glass, metals, plastics, asphaltic and composite materials, etc. Methods include those utilized when making site investigations; excavating techniques and all types of foundations, framing systems; project scheduling; and any other new concepts and techniques of construction, construction equipment and safety. Lect. 3 hrs., Lab 1 hr. *3 hours credit*

### TCE2033 SOILS

*Prerequisites:* PHY1083, PHY1101. Study, analysis, classification, and strength of soil as found in nature and as altered by humans: changes in gradation, moisture content, density, and material for enhancement of soil as a construction material. Other natural and man-made construction materials are examined through analysis of test results, most notably those utilizing natural materials in both bituminous and portland cement concretes. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

### TCE2053 CONSTRUCTION TECHNIQUES 2

*Prerequisites:* PHY1083, PHY1101, MCS2313, TCE2013. Layout and installation of building electrical and mechanical systems, including codes, standards, and laws. Electrical systems to include equipment, lighting, sound and alarm systems, and standby equipment; mechanical systems to include water and sewerage systems, principles of ventilation, heating and cooling for industrial, commercial, and institutional buildings, total energy systems, fire protection equipment and installations, interior transportation systems, and acoustical or radiation protection used in construction. Lect. 3 hrs. *3 hours credit*

### TCE2073 SURVEYING

*Prerequisite:* MCS1123. Introduction to the principles of plane surveying using tape, transit and level. The measurement of angles as well as horizontal and vertical distances, traverse, stadia surveying and mapping, and general construction surveys. A computer is used for balancing a traverse. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

### TCE2093 STRUCTURES

*Prerequisites:* TCE1023, TME2013, TME2033. Detailing of steel structures; framed beam details; details for standard connections, seated connections; typical floor beam details; riveted, bolted and welded connection; detail drawing of compression, tension and flexible member; column details. Both drawing and computer labs utilized in the study of structural design principles. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

### TCE2123 ESTIMATING

*Prerequisites:* TCE1023, TCE2013. Methods of estimating materials and labor required to erect a building. Excavations, foundations, utilities, steelwork, carpentry, roofing, drywall, painting, etc. The computer lab is utilized for assembling partial (trade) and complete construction estimates. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

### TCE2143 SPECIFICATIONS AND REGULATIONS

*Prerequisites:* TCE1023, TCE2013. National (BOCA) and local codes, ordinances and regulations pertaining to commercial, industrial, and residential construction. Interpretation and evaluation of specifications for building construction. Emphasis on descriptive, proprietary, reference standard, performance, and cash allowance specification writing. Lect. 3 hrs. *3 hours credit*

### TCE3113 CONSTRUCTION TECHNIQUES 3

*Prerequisites:* PHY1083, PHY1101, MCS2313, TCE2053. Layout and installation of building electrical systems, including codes, standards and laws. Systems to include lighting, sound and alarm, energy management and standby equipment for industrial, commercial, residential, and institutional buildings. Lect. 3 hrs. *3 hours credit*

### TCE4112 CONSTRUCTION EQUIPMENT

*Prerequisites:* Junior standing or consent of instructor. Operating characteristics and cycle time of construction machines for various types of projects, including heavy civil and commercial/industrial buildings. Analysis of vehicle and equipment economics, operating costs and capacities for measurement of productivities. Lect. 2 hrs. *2 hours credit*

**TCE4113 CONSTRUCTION SAFETY**

*Prerequisites: Junior standing or consent of instructor.* The course is an examination, from a managerial point of view, of construction-related MiOSHA and OSHA rules and regulations. Specific emphasis will be placed on fall protection, confined spaces, underground construction, and trenching. Coverage also includes hazardous materials storage and use, personal protection equipment, training and certification. Lect. 3 hrs. *3 hours credit*

**TCE4122 VALUE ENGINEERING**

*Prerequisites: Senior standing or consent of instructor.* Application of industry methods and techniques for using value engineering in a wide range of construction projects, including buildings and transportation facilities. Use of application software and case studies are emphasized. Lect. 2 hrs. *2 hours credit*

**TCE4123 HIGHWAY ENGINEERING, PAVEMENT DESIGN AND ESTIMATING**

*Prerequisites: TCE2013, TCE2073, TEC2123.* Highway design and construction practices, including geometrics, intersections, cross-sections, and roadside barriers. Emphasis on demand/capacity analysis, traffic flow/control, materials, equipment and safety. Lect. 3 hrs. *3 hours credit*

**TEC2313 ELECTRICAL POWER CONTRACTING AND EQUIPMENT**

*Prerequisites: TEE3103, MCS1123, or consent of instructor.* Introduction to power equipment and control devices, such as transformers, motor control devices, and programmable logic controllers. Lect. 3 hrs. *3 hours credit*

**TEC2323 ELECTRICAL DRAWINGS AND SPECIFICATIONS**

*Prerequisite: TEE3103.* The practical interpretation of electrical drawings and specifications as applied to electrical systems in buildings. Lect. 3 hrs. *3 hours credit*

**TEC2324 THE NATIONAL ELECTRICAL CODE**

*Prerequisites: TEC2313 or consent of instructor.* Introduction to the National Electrical Code, including its organization and layout. Emphasis on how to use the codebook as a reference. Lect. 3 hrs. *3 hours credit*

**TEC2333 ACCOUNTING FOR ELECTRICAL CONTRACTORS**

*Prerequisites: ACC2013.* Accounting topics and methods pertinent to the electrical contractor. Includes fixed and variable costs, revenue forecasting, and budget development with ramifications on pricing. Lect. 3 hrs. *3 hours credit*

**TEC2353 ESTIMATING FOR ELECTRICAL CONTRACTORS**

*Prerequisites: TEC2333, MCS1023, or consent of instructor.* A thorough understanding of the estimating process, as pertaining to electrical contractors. Students develop detailed estimates, using computer software, when appropriate. Lect. 3 hrs. *3 hours credit*

**TEC2363 ELECTRICAL CONSTRUCTION BID PROCESS**

*Prerequisites: TEC2363 or consent of the instructor.* A thorough understanding of the bid process, as pertaining to electrical contractors. Students prepare all documents required for a successful bid submission. Lect. 3 hrs. *3 hours credit*

**TEC2363 ELECTRICAL CAPSTONE EXPERIENCE**

*Prerequisites: Must have completed 45 credit hours in the Electrical Contracting Technology program or have the consent of the instructor.* The capstone course integrates the topics from all coursework comprising the degree. Upon completion, students are expected to have a thorough understanding of all aspects of the electrical contracting industry. Lect. 3 hrs. *3 hours credit*

**TEC2373 INDUSTRIAL CO-OP I**

**TEC2383 INDUSTRIAL CO-OP II**

*Prerequisite: Consent of the instructor.* The student will work for an electrical contractor (sponsor), as a paid employee. These courses are designed to provide students with practical job site experience, so as to permit them to contribute effectively for their subsequent employers, immediately upon graduation. Both courses may be undertaken with a single employer. Co-op, 3 hrs. each. *3 hours credit*

**TEE1023 CIRCUITS 1**

*Prerequisites: MCS1123, MCS1023, PHY1083, PHY1101.* Introduction to electrical and electronic fundamentals. Basic principles involved in DC circuits, study of networks with multiple branches and multiple sources of emf, the application of Thevenins and Nortons theorems, magnetic circuits, capacitance, inductance and transients in DC circuits. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TEE2013 CIRCUITS 2**

*Prerequisites: MCS2313, TEE1023.* Basic principles involved in AC circuit analysis, phasors, series and parallel circuits, mesh and nodal analysis, network theorems, power, resonance, polyphase systems, and transformer. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TEE2033 ELECTRONICS 1**

*Prerequisites: MCS2313, TEE1023, Co-requisite: TEE2013.* Solid state theory, diodes and diode applications, bipolar transistors and circuit configurations, biasing, small signal amplifiers, power amplifiers, bandwidth, FETs and FET amplifiers. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TEE2053 ELECTRONICS 2**

*Prerequisites: TEE2013, TEE2033.* Feedback principles, operational amplifiers, differential amplifiers, analog devices, integrator and differentiator devices, wave shaping, oscillators, multivibrators and pulse generation. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TEE2073 ELECTRICAL DRAWING**

*Prerequisites: MCS1023, TEE2033.* Practical drawing of electrical and electronic circuits, design of printed circuit boards, house wiring and control circuits. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**TEE2093 ELECTRONICS 3**

*Prerequisite: TEE2053.* Introduction to logic, design, logic gates and symbols, combinational and sequential logic, counters, shift registers, NAND and NOR logic design, A/D and D/A conversion. Introduction to computer hardware. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TEE2123 MICROPROCESSORS**

*Co-requisite: TEE2093.* Microprocessor and microcomputer hardware, structure and programming theory are stressed. Interfacing techniques, digital codes, assembly language programming; I/O control and interrupt handling. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

## **TEE2143 ELECTRICAL MACHINERY**

*Prerequisite:* TEE2013. Energy conversion using electromechanical devices, DC and AC motors and generators, transformers, feedback and control, stepping, synchronous and induction motors. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

## **TEE2163 ELECTRONIC COMMUNICATIONS**

*Prerequisites:* TEE2013, TEE2053. Principles of electronic communication, amplitude and frequency modulation, single-side-band communications, transmission lines and wave propagation. Lect. 3 hrs. *3 hours credit*

## **TEE2173 AUTOMATIC CONTROL SYSTEMS**

*Prerequisites:* MCS2313, PHY1083, PHY1101. Introduction to automatic control systems. Primary emphasis on electrical, electronic, and mechanical systems and their components. Hydraulic, pneumatic, temperature control systems and associated computer process control systems are introduced. Lab demonstrations and assignments are included. Lect. 3 hrs. *3 hours credit*

## **TEE2183 INDUSTRIAL ELECTRONICS**

*Co-requisite:* TEE2093. Theory, units, symbols, and mathematic foundation of electromechanical feedback control systems. Transducers applied to industrial controls including positional encoders, optical devices, and display system characteristics. Applications of analog and digital components, and microprocessors, to industrial controls. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

## **TEE2226 TELEVISION/RADIO FACILITY ENGINEERING OPERATIONS**

*Prerequisites:* TEE2163, MCS2313, PHY1083, PHY1101. This class involves broadcast engineering overview, connection

to system, production methods and equipment, post production activities including editing, graphics, audio production and post production, studios, mixing, signal delivery and management, robotics and automation, electrical and HVAC activities, RF systems, project management, good engineering practices, facility design and engineering troubleshooting. Lecture and laboratory. *6 hours credit*

## **TEE3103 DC/AC CIRCUITS**

*Prerequisites:* Junior standing, MCS2313, MCS1023, PHY1083, PHY1101. Introduction to electrical fundamentals. Basic principles involved in DC circuits, study of networks with multiple branches and multiple sources of emf, magnetic circuits, capacitance, inductance and transients in DC circuits. Basic principles involved in AC circuit analysis, phasors, series and parallel circuits, mesh and nodal analysis, network theorems, power, resonance, polyphase systems, and transformer. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

## **TIE2013 PRODUCTIVITY AND WORK MEASUREMENT**

*Prerequisites:* MGT2203, COM2103. Productivity and its influences; selecting aspects of work performance to measure; traditional industrial engineering approaches to analyzing, measuring, and improving work methods; and systems approaches to productivity improvement. Lect. 3 hrs. *3 hours credit*

## **TIE2033 ERGONOMICS AND SAFETY**

*Prerequisites:* MCS2313, COM1103. Fundamentals and basic principles of ergonomics emphasizing static and functional anthropometry, vision, illumination and visual displays; audition, noise and auditory displays; anatomy of movement and biomechanics; physical force effects and

handtool design. Changing attitudes of government and industry regarding safety, development of workmans compensation, OSHA, safety standards. Accident investigation, hazards, their elimination and control. Lect. 3 hrs. *3 hours credit*

## **TIE2063 MANUFACTURING PROCESSES 1**

*Prerequisite:* 0. Fundamentals of machining operations including the study of carbide cutting tools and conventional machining operations such as turning, drilling, boring, milling, broaching, and grinding; metal casting and coating processes, plastic molding, powder metallurgy, metal stamping and forming, bulk deformation of metals, welding and related processes with lab demonstrations. Lect. 3 hrs. *3 hours credit*

## **TIE2093 METROLOGY & QUALITY CONTROL**

*Prerequisites:* MCS2023, MCS1023. All phases of metrology and quality control organization & objectives, including measurement, inspection methods, equipment and statistical techniques, utilized in business & industry. Practical application for controlling quality through hands-on project development and solution, SPC, charting, computer sampling and analysis programs, and cost considerations in quality planning. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

## **TIE2123 PROJECT MANAGEMENT**

*Prerequisite:* MCS1023. A systematic method for organizing and directing personnel, finances, and other resources in planning, scheduling, and controlling projects. Introduces project management computer programs and includes work on assigned projects. Lect. 3 hrs. *3 hours credit*

## **TIE2153 MANUFACTURING PROCESSES 2**

*Prerequisites:* Sophomore standing, TIE2063. Capstone course showing the fundamentals of process engineering including part print, dimensional and tolerance analysis. The study of tolerance charts and workpiece control, classifying operations, selection and planning the process of manufacture, and the manufacturing sequence. Introduces metrology, geometric dimensioning and tolerancing as well as simultaneous engineering. Lab project. Lect. 3 hrs. *3 hours credit*

## **TIE2163 ENGINEERING ECONOMICS AND ACCOUNTING**

*Prerequisite:* MCS1023. Introduction to several analytical methodologies that can be used to evaluate the financial performance of capital projects and expenditures. Concepts of time value of money, cash flow, capital rationing, rate of return, and effects of inflation are addressed. Accounting concepts such as depreciation, exchanges of assets, definition of income and differential costing. Lect. 3 hrs. *3 hours credit*

## **TIE4115 SENIOR PROJECT**

*Prerequisites:* Senior standing, COM2103. Students brainstorm product ideas; do a market survey on a selected product; conduct a patent search; design, construct and demonstrate a working model both in class and public display. An engineering cost analysis, manufacturing feasibility and a marketing plan are done. Several oral presentations and work outside the classroom required. *5 hours credit*



**TME1023 TECHNICAL GRAPHICS**

*Prerequisite:* 0. Concepts of mechanical drawing with emphasis on visualization; includes dimensioning, sectioning and tolerancing. Fundamentals of orthographic, isometric and auxiliary projections and experience of applying these principles to the solution of space problems. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**TME2013 STATICS**

*Prerequisites:* MCS2313, MCS1023, PHY1063. Analytical and graphical study of forces, moments and couples. Determination of the resultant and equilibrium of all types of force system (ex-coplanar, concurrent non-parallel systems), solution of truss problems by methods of joints and methods of sections. Theory of static friction with related problems. Determination of centroids of composite bodies. Several problems are solved by computer. Lect. 3 hrs. *3 hours credit*

**TME2033 MECHANICS OF MATERIALS**

*Prerequisite:* TME2013. Methods for the calculation of shear, tension, torsion, and compression stresses in industrial materials. Design and analysis of engineering structures, analysis of statically determinate beams. Experimentation in tensile, structure deflection, shear, and fatigue failure. The computer is used for problem solving and analysis. Lect. 3 hrs. *3 hours credit*

**TME2053 DYNAMICS**

*Prerequisite:* TME2013. Analytical study of the motion of rigid bodies. Inertia, mass, Newtons laws of motion, equations rotation, plane motion, moment of inertia, and radius of gyration are covered. Angular velocity analysis of compound and epicyclic gear trains, displacement, velocity and acceleration analysis of mechanisms. Lect. 3 hrs. *3 hours credit*

**TME2073 THERMODYNAMICS**

*Prerequisites:* MCS2313, PHY1083, PHY1101. Work, heat, pressure, first law of thermodynamics, thermodynamic systems, properties, energy transfers, conservation, equations of state, process calculations, entropy, p-v and t-s diagrams and air tables. Complete cycles, second law, internal combustion engines, irreversibility, gas turbines. Included are topics in heat transfer and numerical analysis. Lect. 3 hrs. *3 hours credit*

**TME2123 FLUIDS**

*Prerequisites:* MCS2313, PHY1083, PHY1101, TME2013. The principles of fluid mechanics and applications to practical applied problems. Hydrostatics pressures, manometers, U-tube, buoyancy, and stability; hydrodynamics laminar and turbulent flow, system losses, velocity profiles, fluid flow. Compressible flow analysis. The computer is used for problem solving and analysis. Lect. 3 hrs. *3 hours credit*

**TME2143 MATERIALS 1**

*Prerequisites:* PHY1083, PHY1101. Properties of materials, test methods and the influence of changes in physical conditions and chemical composition on the properties of metals, alloys, polymers, woods, ceramics, and glass. Laboratory demonstrations include metallography, hardness testing techniques, polymer deformation, and composites. Lect. 3 hrs. *3 hours credit*

**TME2163 COMPUTER GRAPHICS**

*Prerequisites:* TME1023. Introduction to design, utilizing CAD system hardware, particularly microcomputer equipment in conjunction with system software. Techniques in creating two and three dimensional points, lines,



curves, arcs, and components used in technical drawing and mechanical design. Created digital data is transferred to hard copy on system plotters. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**TME2213 MECHANICAL DESIGN**

*Prerequisites:* Sophomore standing, TME2033, TME2143. Preparation of sketches, drawings of components, assemblies, and design calculations. Emphasizes design decision making concepts and appropriate application of dimensioning, tolerancing, applicable standards, and conventions. Students develop solutions to practical mechanical design problems and team projects presented to the class. Students are expected to utilize previously acquired MET program skills. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**TME3113 ENGINEERING MECHANICS**

*Prerequisites:* Junior standing, MCS1023, MCS2313, PHY1063. Analytical and graphical study of static forces, moments and couples. Determination of the resultant and equilibrium of all types of force system (ex-coplanar, concurrent non-parallel systems). Theory of static friction with related problems. Determination of centroids of composite bodies. Analytical study of the motion of rigid bod-

ies. Inertia, mass, Newtons laws of motion, equations rotation, plane motion, angular velocity analysis of compound and epicyclic gear trains; displacement, velocity and acceleration analyses of mechanisms. Lect. 3 hrs. *3 hours credit*

**TME4103 ENGINEERING MATERIALS 2**

*Prerequisites:* Junior standing, CHM3144. Properties of metals, alloys, polymers, wood, glass and ceramic materials. The influence of physical conditions and chemical composition on these properties. Metallographic techniques, sample treatment testing techniques. Lect. 3 hrs., Lab. 1 hr. *3 hours credit*

**TOM3113 OPERATIONS MANAGEMENT**

*Prerequisites:* MGT2203 and MCS2113 or MCS2023. An overview of production functions in both manufacturing and service organizations. Forecasting, capacity planning, product and service system design, aggregate planning, inventory and project management, and quality assurance. Lect. 3 hrs. *3 hours credit*



**TOM4093 INDEPENDENT STUDY IN OPERATIONS MANAGEMENT**

*Prerequisites: Senior standing and faculty approval.* Under the guidance of a faculty member, students conduct an intensive investigation of a topic within the field of manufacturing. A written proposal is required for approval. Projects typically include library research, interviews with operating and/or staff managers, and other requirements appropriate to the topic. One of the products of this project is a report.  
3 hours credit

**TOM4123 ADVANCED OPERATIONS MANAGEMENT**

*Prerequisite: TOM3113.* Specific operating decisions with emphasis in the areas of location planning, facilities layout, material requirements planning, scheduling, just-in-time production, learning curve, work systems design, and process control. Lect. 3 hrs.  
3 hours credit

**COOPERATIVE EDUCATION IN ENGINEERING TECHNOLOGY**

**TCO3001 CO-OP PRACTICUM I**

*Prerequisites: Junior standing, completion of associate degree, 2.25 LTU GPA, departmental approval.* First full-time work assignment providing engineering technology experience in the workplace. 1 hour credit

**TCO3101 CO-OP PRACTICUM II**

*Prerequisites: Satisfactory completion of TCO3001, departmental approval.* Second full-time work assignment providing engineering technology experience in the workplace. 1 hour credit

**TCO4001 CO-OP PRACTICUM III**

*Prerequisites: Satisfactory completion of TCO3101, departmental approval.* Third full-time work assignment providing engineering technology experience in the workplace. 1 hour credit

**GREENFIELD COALITION**

**Associate of Science in Manufacturing Engineering Technology**

**Program Director:**  
SABAH R. ABRO,  
sabah@ltu.edu, 248.204.2069,  
office E179

**GCC1012 BASIC CHEMISTRY**

*Prerequisite: GCM1021.* The scope of chemistry, chemical reaction/measurement, mass, weight and density, temperature, periodic table, and Factor-Label Method. Includes solutions, acid and base chemistry, redox reactions, energy/enthalpy and Hess' Law.  
2 hours credit

**GCC2012 CHEMISTRY/MATERIAL SCIENCE**

*Prerequisites: GCM1021-GCC1021.* Chemical equilibria and chemical kinetics. Methods for solving complex equilibrium problems; gas phase equilibria; solution equilibria and heterogeneous equilibria. Includes electrochemistry, corrosion and degradation of materials and advanced topics in kinetics. 2 hours credit

**GCE2261 CONTROL ELEMENTS IN MANUFACTURING SYSTEMS**

*Prerequisite: GCT1221.* An overview of control systems and a study of the application of sensors and actuators in control systems, digital logic, and programmable logic controllers. 1 hour credit

**GCE2412 MANUFACTURING PLANNING**

*Prerequisite: GCF1013, GCE2462.* An introduction into manufacturing economics, basic concepts of direct and indirect costs, and time value of money. Material requirements planning, basic dynamics of material requirements planning, the basic lot sizing techniques used in MRP, and the difference between MRP and other release control techniques such as Kanban.  
2 hours credit

**GCE2462 ENGINEERING ECONOMICS**

*Prerequisite: GCM1021.* The fundamental and advanced concepts of engineering and economic evaluation of singular or pair-wise manufacturing engineering projects. Economic evaluation of multiple and mutually exclusive projects in manufacturing engineering, and the economic evaluation of multiple and independent projects in manufacturing operation.  
1 hour credit

**GCF1013 INTRODUCTION TO COMPUTERS IN ENGINEERING**

*Prerequisite: GCM1021.* Computer basics, operating systems, introduction to computer hardware, word processing, spreadsheets, and Visual Basic.  
3 hours credit

**GCF1133 INTRODUCTION TO DESIGN GRAPHICS**

*Prerequisites: GCF1011, GCF1033.* An introduction into the computer processes used in the design graphics field and the coupling needed between design and manufacturing. Visualization, generation of design geometry using 3-dimensional solids as the geometry primitives, control and utilization of design geometry, the design-graphics process, and the CAD to CAM process including data base type of tracking and validation of processes, including process planning, materials, features, etc. 3 hours credit

**GCL1013 FUNDAMENTALS OF ENGLISH COMPOSITION: ESSAYS AND VISUALS**

*Prerequisite: MTI.* The writing process, report writing, memos, letters and editing reports. Applying strategies for locating information using library and computer sources to design and write a research report. Writing essays and designing visuals.  
3 hours credit

**GCL1214 PSYCHOLOGY WITH SOCIOLOGY I-IV**

*Prerequisites: GCO0990, GCL1021.* Methods, learning and memory; physiological and sensory psychology; human growth, development, and personality; and social psychology and sociology.  
4 hours credit

**GCL2013 COMMUNICATIONS IN MANUFACTURING**

*Prerequisite: GCL1013.* Theories of communication, persuasion, organizational communication, effective communication opportunities and obstacles, and the ethics of communications. Methods of communications, project proposal and technical presentations and an introduction into traditional and non-traditional media presentations. 3 hours credit

**GCL2614 COMPARATIVE POLITICS AND ECONOMICS**

*Prerequisite: GCL1013.* Globalization issues. Integration of social, political, and economic knowledge for a manufacturing company's expansion in the global market. Modular topics include team building, research strategies, project planning, cultural understanding, comparative political systems, economic development models and comparative economic systems, and political and economic integration methods.  
4 hours credit

**GCM1013 TECHNICAL MATHEMATICS I**

*Prerequisite: Basic Math (MTI).* Fundamental operations of functions and graphs, system of linear equations, quadratic equations, exponential and logarithmic functions, introduction to matrices, operations with matrices, determinants, Cramer's rule, linear inequality, introduction to plane geometry, conic sections. *3 hours credit*

**GCM1022 TECHNICAL MATHEMATICS II**

*Prerequisite: GCM1013.* Trigonometric functions with right triangle applications, radian measure, general trigonometric functions, graph of trigonometric functions, identities and formulas, trigonometric equations, Vectors in two and three dimensional space, complex numbers and polar coordinates. *2 hours credit*

**GCM2114 TECHNICAL CALCULUS**

*Prerequisite: GCM1022.* Limits, Continuity, tangents, derivatives, curve sketching, indefinite and definite integrals, applications of derivatives, related rates, area between two curves, derivatives and integration of transcendental functions, use of computer based modules and maple/mathpert. *4 hours credit*

**GCM2413 STATISTICAL METHODS**

*Prerequisite: GCM1013.* Frequency distributions, descriptive statistics of samples and populations, Probability distributions, discrete random variables, continuous random variables, Bayes theorem, central limit theorem, estimation and confidence intervals, hypothesis testing, goodness of fit, simple and multiple regression and correlation. *3 hours credit*

**GCS2113 MECHANOPHYSICS**

*Prerequisite: GCM1051.* An introduction to basic physics concepts related to the study of motion and forces, and static equilibrium.

Translation and rotation of a rigid body, rigid body rotation, coriolis effect, vectors and motion, velocity and mechanisms, and acceleration and mechanisms. *3 hours credit*

**GCS2141 INTRODUCTION TO ENGINEERING MECHANICS**

*Prerequisite: GCS2113.* Introduction to vibrations of mechanical systems and to the basic concepts of engineering structural analysis. *1 hour credit*

**GCS2211 THERMOSCIENCE**

*Prerequisites: GCM1051, GCM2141.* Introduction to the properties and laws associated with thermodynamics, fluid mechanics, and heat transfer. Fluid density, pressure, and viscosity; fluids at rest (including Pascal's and Archimedes' principles); conservation of mass; Bernoulli equation; temperature scales; thermal expansion of liquids and solids; specific heats and heats of transformation; the first law of thermodynamics; kinetic theory of gases; and the second law of thermodynamics. *1 hour credit hour*

**GCS2313 ELECTROSCIENCE**

*Prerequisite: GCM1051.* Fundamental principles of electrostatics, the concepts of DC-analysis and the study of the functioning of the many devices and everyday applications employing the principles of electromagnetism and/or inductors and capacitors. *3 hours credit*

**GCT1112 MACHINING PROCESSES**

*Prerequisites: GCF1113, GCM1021.* Introduction to basic machine tool operations and material removal technology. Topics include process technology associated with material removal, cutting tool mechanics, mathematical process relations, cutting fluids and process planning. *2 hours credit*

**GCT1211 FOUNDATIONS OF MEASUREMENTS**

*Prerequisite: GCM1021.* Presentation of terminology, procedures, and capabilities of devices used in the field of measurement; measurement statistics. *1 hour credit*

**GCT1221 INSTRUMENTATION**

*Prerequisite: GCM1021.* Instrumentation used in manufacturing environments. Overview of control system terms, discrete/binary signals, multiplexed signals, analog to digital conversion, and a study of programmable logic controllers. *1 hour credit*

**GCT2012 ENGINEERING MATERIALS**

*Prerequisites: GCC1012, GCM1021.* Developing an understanding of the many types of materials that are used in our technological society. Metals ceramics, polymers, composites, materials selection and materials for manufacturing. A project is completed on a work piece of the student's choice. *2 hours credit*

**GCT2112 MANUFACTURING PROCESSES**

*Prerequisites: GCT1212, GCT2012.* Introduction into the issues of product quality and tolerances, manufacturing processes for casting and how the various methods influence secondary operations such as machining and metal forming processes. Manufacturing joining processes which include various types of welding, brazing and soldering and a study of the heat flow in the work place. *2 hours credit*

**GCT2182 TOOL DESIGN**

*Prerequisites: GCM1021, GCF1113, GCT1112, and GCT2012.* Tool design methods, tool-work interaction, tool materials and work holding principles, design of drill jigs, design of fixtures, and tool design guide. *2 hours credit*

**GCT2212 ELECTRICAL MACHINES**

*Prerequisite: GCS2313.* Introduction to the theoretical and practical knowledge to achieve an understanding of the analysis of DC/AC circuits, industrial electric power specifications, industrial transformers, industrial and special purpose electric machines, and industrial solid state motor controllers and devices. *2 hours credit*

**GCT2314 MANUFACTURING SYSTEMS**

*Prerequisite: GCE2412.* Introduction to manufacturing systems design. Fundamentals of manufacturing systems design, graphical analysis tools, mathematical analysis tools, and data communications networks. *4 hours credit*

**GCT2452 ETHICS AND INDUSTRY**

*Prerequisite: GCL1013.* Introduces engineering students to the ethical dimensions of their profession and to the interrelations of engineering projects and society. Includes the impact of technological systems on culture, especially American culture, and reactions of our culture to technology. *2 hours credit*

**GCT2511 DESIGN PROJECT**

*Prerequisite: 42 credits and two job rotations.* A design project incorporating fundamentals learned in previous courses. The design process is emphasized from the establishment of objectives and analysis of alternative solutions to a final evaluation and recommendation. Final written and oral report required, and use of manufacturing facility in production of design is encouraged. *1 hour credit*

## DEPARTMENT OF MECHANICAL ENGINEERING

### Professors:

Daw R. Al-Werfalli  
 Steven K. Howell (chair)  
 Harold Josephs  
 Sayed A. Nassar, emeritus  
 Patricia M. Shamamy  
 Khalil S. Taraman  
 Vladimir Vantsevich

### Associate Professors:

Clarence G. Chambers, Jr.  
 emeritus  
 Vernon M. Fernandez  
 Robert Fletcher  
 Lewis G. Frasch  
 Badih Jawad  
 Laura L. Lisiecki  
 Kingman E. Yee

### Assistant Professors:

Andrew Gerhart  
 Chris H. Riedel

### College Professors:

Suresh C. Bansal  
 Suraj (Steve) Bhonsle  
 Gregory Feierfell  
 Sanaa Taraman

### Lecturers:

Additional guest lecturers are assigned to selected courses and sections based on their specialties and expertise and are listed in the faculty roster.



### EGE1012 INTRODUCTION TO ENGINEERING

*Prerequisite: Permission of instructor.* Survey of the scope of engineering and the engineer's role in society. Basic engineering tools such as math modeling, calculator usage and graphic design principles. Design project involving teamwork required. Lect. 2 hrs. 2 hours credit

### EGE1023 ENGINEERING MATERIALS I

*Prerequisite: CHM1213.* Introduction to solid materials, equilibrium phase diagrams, the properties of materials, test methods, and the influence of variations in physical condition and chemical composition on the properties of metals, plastics, elastomers, glass, cements, etc. Lect. 3 hrs. 3 hours credit

### EGE1101 ENGINEERING COMPUTER

**APPLICATIONS-EXCEL**  
*Prerequisite: MCS0093, Co-requisite: MCS1414.* Introduction to the use of computers as an engineering problem-solving tool. Engineering analysis problems that involve plotting of data, statistics, curve fitting, root finding, and logical decision-making are presented and solved using spreadsheets (Excel). 1 hour credit

### EGE1201 ENGINEERING COMPUTER

**APPLICATIONS-MATHCAD**  
*Prerequisite: MCS0093, Co-requisite: MCS1414.* Introduction to the use of computers as an engineering problem-solving tool. Engineering analysis problems that involve plotting of data, statistics, curve fitting, root finding, and logical decision-making are presented and solved using Mathcad. 1 hour credit

### EGE1301 ENGINEERING COMPUTER

**APPLICATIONS-MATLAB**  
*Prerequisite: MCS0093, Co-requisite: MCS1414.* Introduction to the use of computers as an engineering problem-solving tool. Engineering analysis problems that involve plotting of data, statistics, curve fitting, root finding, and logical decision-making are presented and solved using Matlab. 1 hour credit

### EGE2013 STATICS

*Prerequisites: MCS2414, PHY2413.* Vector Algebra; resultant of force systems; equilibrium force systems; equilibrium of particles, rigid bodies using free-body diagrams; friction; centroids; moments of inertia. Lect. 3 hrs. 3 hours credit

### EGE2201 FINANCE FOR ENGINEERS

*Prerequisite: Sophomore standing, Co-requisite: COM2103.* Introduction to the concepts in and around financing entrepreneurial companies. How general managers use the financial perspective to make better decisions in entrepreneurial settings. Basic principles of financing, stock capitalization, company valuation, equity versus debt, evaluating financing providers, staged financings, initial public offering, and others. A combination of teaching and learning techniques include lecture/discussion sessions, readings from articles and company prospectus, case studies, and guest lectures. Intended only for undergraduate engineering students. Lect. 1 hr. 1 hour credit

### EGE2211 MARKETING FOR ENGINEERS

*Prerequisite: COM2103.* Introduction to marketing concepts, methods, and practices that are important to modern technical enterprises. As a discipline, marketing is responsible for facilitating the exchange process. This is accomplished through an understanding of the perceptions, preferences, and behaviors exhibited by customers and consumers. That understanding is translated into a

complete offering (product/service/features, price, advertising/promotion, and distribution system). Intended only for undergraduate engineering students. Lect. 1 hr. 1 hour credit

### EGE2221 ENGINEERING ENTERPRISE 1

*Prerequisite: Sophomore standing.* First course in the Enterprise Work sequence. Students work in teams on a real-life engineering project. Basic machine shop operations including safety principles. Hands-on experience in building and testing. Applications of project management, engineering design, technical communication, and teamwork through working on teams with senior level students. Lect. 1 hr. 1 hour credit

### EGE2231 PROJECT MANAGEMENT FOR ENTREPRENEURIAL ENGINEERS

*Prerequisite: Sophomore standing.* A basic course for the entrepreneurial engineer. Basic concepts are project management tools, fundamentals of team building, project risk analysis, tracking, measuring, and controlling projects, project closeout, budgets, and business cultural issues. Identifying project participants, goals, objectives, activities, and constraints. Quantitative methods



include network diagrams, Gantt charts, CPM scheduling, activity duration compression, project activity optimization, activity analysis, cost and schedule performance indices, and cost estimating. Active learning is utilized with a combination of teaching and learning techniques, including lecture, discussions, reading, case studies, guest lectures, and hands-on projects. Intended only for undergraduate engineering students. Lect. 1 hr. *1 hour credit*

**EGE3003  
THERMODYNAMICS**

*Prerequisites: MCS2414, PHY2413.* Thermodynamic systems, the first law of thermodynamics, transient and steady flow processes, physical properties, the second law of thermodynamics, reversible and irreversible processes, the property entropy, vapor and gas power cycles. Lect. 3 hrs. *3 hours credit*

**EGE3012 ENGINEERING  
COST ANALYSIS**

*Prerequisite: 0.* Basic development of the cost consequences of engineering decision-making. Interest calculations, cash flow equivalences, annual cash flows, rates of return, incremental analysis and other analytical approaches. Depreciation, income taxes and replacement analysis. Lect. 2 hrs. *2 hours credit*

**EGE3193 ALTERNATIVE  
ENERGY**

**EGE3301 BUSINESS LAW  
FOR ENGINEERS**  
*Prerequisite: COM2103.* Foundation in business law including types of business formations, sole proprietorships, partnerships, corporation, and Limited Liability Companies. The strategic management of intellectual property assets is introduced, with special emphasis on internal protec-

tion and management of these assets. Issues of product liability and ethics are introduced through a mix of classroom lectures, readings, case analyses and projects. Intended only for undergraduate engineering students. Lect. 1 hr. *1 hour credit*

**EGE3311 STRATEGIC  
MANAGEMENT FOR  
ENGINEERS**

*Prerequisite: EGE2211.* How top management develops plans to attain outcomes consistent with an organization's mission and goals. Uses case studies and a potential corporate venture to convey how to establish an organization's mission and develop its goals, analyze opportunities and threats or constraints that exist in the external environment, analyze the organization's strengths and weaknesses, formulate strategies to match the organization's strengths and weaknesses with the environment's opportunities and threats, develop ways to implement strategies, and ways to implement control activities to ensure that the organization's goals are attained. Intended only for undergraduate engineering students. Lect. 1 hr. *1 hour credit*

**EGE3321 ENGINEERING  
ENTERPRISE 2**

*Prerequisite: EME2221.* Second course in the Enterprise Work sequence. Students work in teams on a real-life engineering project. A continuation of participation in student enterprises at Lawrence Tech. Principles of project management, engineering design, budgeting, technical communication, and teamwork are reinforced through working on teams with senior level students. Lect. 1 hr. *1 hour credit*

**EGE3331 ENGINEERING  
ENTERPRISE 3**

*Prerequisite: EME3321, Co-require: EME4003.* Third course in the Enterprise Work sequence. Students apply principles of the engineering design process, proposal writing, project planning, and project management. Students form groups, choose a senior project, and submit a project proposal. The project proposal is a complement to the business plan being generated in the EGE3341 Business Plan Development course. Lect. 1 hr. *1 hour credit*

**EGE3341 CORPORATE  
ENTREPRENEURSHIP FOR  
ENGINEERS**

*Prerequisite: COM 2103.* The nature of entrepreneurship and the effective implementation of entrepreneurial strategies in large engineering enterprises. Focuses on the identification, development, and exploitation of technical and organizational innovations to meet enterprise goals, the management of new product/process developments, and effective new venture management in a corporate context. Lect. 1 hr. *1 hour credit*

**EME2011 MATERIALS  
LABORATORY**

*Prerequisites: EGE1023, COM2103.* A project laboratory devoted to the study of metallographic techniques, heat treatment, structures of metals, alloys, ceramics, and plastics, and physical testing. Lab. 2 hrs. *1 hour credit*

**EME2012 MECHANICAL  
ENGINEERING GRAPHICS**

*Prerequisite: 0.* An integrated course in engineering graphics for all students in the College of Engineering. Introduction to graphics in design, fundamentals of orthogonal projection and experience in applying these principles to the solution of space problems. ACAD software. Lect. 1 hr., Lab. 2 hrs. *2 hours credit*

**EME3011 INTRODUCTION  
TO ENGINEERING  
PROJECTS**

*Prerequisite: Junior standing. Student needs a passing grade in EME4003 before enrolling in EME4212.* Introduction to the design process, matching engineering specifications to customer requirements, prototyping, product testing and evaluation, project planning and management. Students select senior projects, form project teams and submit a project pre-proposal. Orientation to fabrication facilities. Lab 2 hrs. *1 hour credit*

**EME3013 MECHANICS OF  
MATERIALS**

*Prerequisite: EGE2013.* Stress as internal force intensity. Stress and deflections due to: axial, torsional, and bending loads; statically indeterminate loads, stress and strain transformation, buckling and design of an efficient structure. Lect. 3 hrs. *3 hours credit*

**EME3023 MANUFACTURING  
PROCESSES**

*Prerequisite: EGE1023.* Relationship between product engineering and manufacturing engineering. Casting processes, bulk deformation processes, sheet metal processes, joining and welding processes, single-cutting-edge operations, multi-cutting-edge operations, random-cutting-edge operations, non-traditional machining, design for fabricability, the factory of the future. Lect. 3 hrs. *3 hours credit*

**EME3024 FLUID  
MECHANICS**

*Prerequisites: EGE3003, EME3013, EME3043.* Fluid statics; conservation of mass, momentum, and energy; dimensional analysis and similitude; pipe flow; laminar and turbulent boundary layers; lift and drag on immersed bodies, potential flow, compressible flow. Lect. 4 hrs. *4 hours credit*



**EME3033**

**EME3034 KINEMATICS & DYNAMICS OF MACHINES**

*Prerequisite: EME3043.*  
Mechanisms; linkages, cams, gears and gear trains; displacement, velocity; acceleration, synthesis of mechanisms. Dynamic force analysis of machines including general linkage, cams, slider cranks, and space mechanisms. Syntheses of dynamically constrained components. Lect. 4 hrs. 4 hours credit

**EME3043 DYNAMICS**

*Prerequisite: EGE2013.*  
Kinematics and kinetics of particles, rigid bodies, and systems of particles and rigid bodies will be analyzed by the classical methods; vibrations of single degree of freedom systems. Lect. 3 hrs. 3 hours credit

**EME4003 DESIGN OF MACHINE ELEMENTS**

*Prerequisite: EME3013.* Student needs a passing grade in EME4003 before enrolling in EME4212. Application of the principles of solid mechanics and other engineering sciences to the efficient design of simple machine elements such as fasteners, gears, springs, and simple structures. Mechanical failure criteria and the effects of fatigue and impact loading on components are presented. Lect. 3 hrs. 3 hours credit

**EME4013 HEAT TRANSFER**

*Prerequisites: EGE3003; EME3024 recommended, but may be a co-requisite.* Steady and transient conductive heat transfer; radiative heat transfer, forced and free convection heat transfer, psychometrics. Design of heat exchangers. Lect. 3 hrs. 3 hours credit

**EME4123 AUTOMATED MANUFACTURING SYSTEMS**

*Prerequisite: EME3023.* Overview of automated manufacturing systems, numerical control machines and programming, adaptive control, automated material handling, integrated flexible manufacturing systems. Lect. 3 hours. 3 hours credit

**EME4133 MANUFACTURING FACILITIES DESIGN**

*Prerequisites: EME4123 and Senior standing.* Design of the manufacturing plant to use space, machines, material handling methods, and equipment for economical production and inspection. Lect. 3 hrs. 3 hours credit

**EME4143 WORLD CLASS MANUFACTURING**

*Prerequisite: EME3023.* Excelling in world class manufacturing. Concurrent engineering, product development, quality engineering, automated inspection and testing, statistical process control, cellular manufacturing, manufacturing cost estimating, total productive maintenance, agile manufacturing, quality systems standards, and total quality. Lect. 3 hrs. 3 hours credit

**EME4212 ENGINEERING PROJECTS 1**

*Prerequisites: EME3011, EME4003.* Initiation of the senior design project, formal engineering proposal, oral presentation, concept development, project documentation. Student project teams work closely with a faculty advisor. 2 hours credit

**EME4222 ENGINEERING PROJECTS 2**

*Prerequisite: EME4212.*  
Completion of the senior project, formal final report, oral presentation, prototype development, fabrication, testing and evaluation. Student project teams work closely with a faculty advisor to meet project objectives. 2 hours credit

**EME4243 FINITE ELEMENT ANALYSIS**

*Prerequisite: EME3013.*  
Introducing the theory and application of the FEA method to the stress analysis and design of mechanical systems. Matrix methods in structural analysis are used. Element and structural stiffness matrices are developed and used to solve for displacement, strains, and stresses in trusses, beams, and plane problems. Boundary conditions and modeling consideration. Introduction to general purpose FEA software. Lect. 2 hrs., Lab. 2 hrs. 3 hours credit

**EME4263 MICROMECHANICS OF MATERIALS**

*Prerequisites: EGE1023, EME3013.* Mechanical behavior of materials, emphasizing the effects of microstructure on properties. Models for deformation, fracture, and fatigue. Analytical and predictive methods useful to the design engineer. Materials testing and proper use of materials property data. Lect. 3 hrs. 3 hours credit

**EME4313 FUNDAMENTALS OF QUALITY SYSTEMS**

*Prerequisite: Senior standing, EME3023, MCS3403.*  
Considerations for developing and implementing effective quality systems. An overview of the fundamentals of statistical principles and analysis of process variability, sampling techniques, control charts, ISO 9000/QS 9000 and

process improvement. Lect. 3 hrs. 3 hours credit

**EME4333 SAFETY ENGINEERING**

*Prerequisite: Senior standing.*  
Introduction to the basic principles of safety, analytical approaches to address concerns in the design and operation of products, equipment, facilities, environmental concerns and human factors. Legal aspects of safety and government regulations emphasized. Lect. 3 hrs. 3 hours credit

**EME4363 THERMAL FLUID SYSTEM DESIGN**

*Prerequisites: EGE3003, EME3024, EME4013.* Students work individually or in small groups to design systems and/or devices. Piping systems, heat exchangers, prime movers, system simulation and fluid transients. Lect. 3 hrs. 3 hours credit

**EME4402 MECHANICS LABORATORY**

*Prerequisites: EME3013, EME3043.* Illustrates the principles of mechanics (dynamics, mechanics of materials) and introduces the tools and techniques of experimental mechanics. Lect. 1 hr., Lab. 2 hrs. 2 hours credit

**EME4412 THERMAL SCIENCE LABORATORY**

*Prerequisites: EME3024, EME4013.* The study of heat transfer, fluid flow, thermodynamics, data acquisition, and control. Experiments illustrate each topic and reports are written for each experiment. Lect. 1 hr., Lab. 2 hrs. 2 hours credit

**EME4603 INTRODUCTION TO MECHANICS (Non-ME)**

*Prerequisites: EGE2013, not open to mechanical engineering majors.* Exposes non-mechanical engineering students to the principles of engineering mechanics. Dynamics, strength of materials, gears, and vibrations. Lect. 3 hrs. 3 hours credit

**EME4613 INTRODUCTION TO THERMAL SYSTEMS (Non-ME)**

*Prerequisites: MSC2413, PHY2413; not open to mechanical engineering majors.* The principles of engineering thermodynamics, fluid mechanics, and heat transfer. Conservation of mass and energy, brief topical coverage of the second law of thermodynamics, thermodynamic cycles, hydraulics, flow losses, coefficients of drag, and heat exchanges. Lect. 3 hrs. *3 hours credit*

**EME4981 - EME4983 SPECIAL TOPICS IN MECHANICAL ENGINEERING**

*Prerequisite: Dependent on topic.* Hours of credit designated by last digit in course number. Covers a new or specialized topic in mechanical engineering for which there is strong faculty and student interest, but is not covered in other courses.

**EME4991 - EME4993 DIRECTED STUDY IN MECHANICAL ENGINEERING**

*Prerequisite: Senior standing; consent of department chairman.* Hours of credit designated by last digit in course number. In-depth study of a particular mechanical engineering topic. An approval form, outlining the proposed study, must be submitted and approved prior to election of course.

**EME5103 FASTENERS AND BOLTED JOINTS**

*Prerequisite: EME4003.* Introduction to the analysis, behavior and design of fasteners and bolted joints for static and cyclic loading. Assembly and in service issues and parameters as well as the reliability of bolted assemblies. Lect. 3 hrs. *3 hours credit*

**EME5113 POLYMER MATERIALS AND PROCESSES**

*Prerequisite: EGE1023 or graduate standing.* Behavior, processing and applications of plastics; how fundamental characteristics of polymers influence the properties of plastics. Emphasis on the design and manufacture of plastic parts. Lect. 3 hrs. *3 hours credit*

**EME5123 OPTIMIZATION OF MANUFACTURING SYSTEMS**

*Prerequisite: EME3023.* Principles necessary to apply modern optimization techniques to manufacturing applications. Classical, modern mathematical, and artificial intelligence methodologies. Lect. 3 hrs. *3 hours credit*

**EME5133 ADVANCED FLUID MECHANICS**

*Prerequisite: EME3024.* Compressible flow; shock waves; duct flow with friction and heat transfer; propulsion; turbomachinery; flow measurements; design project and review. Lect. 3 hrs. *3 hours credit*

**EME5143 INTERNAL COMBUSTION ENGINES**

*Prerequisite: EGE3003.* Methods of predicting engine performance; e.g., power, torque, efficiency and fuel consumption. Fuels, air and fuel induction systems, spark and valve timing and matching the engine to the vehicle. Experimental measurement procedures. Lect. 3 hrs. *3 hours credit*

**EME5153 APPLIED THERMODYNAMICS**

*Prerequisite: EGE3003.* The concept of availability, refrigeration cycles, mixtures and psychometrics, combustion and thermochemistry, chemical equilibrium, equations of state and thermodynamic relations. Lect. 3 hrs. *3 hours credit*

**EME5203 DESIGN OF MECHANICAL JOINTS**

*Prerequisite: EME4003.* Complements EME5103, which addresses the threaded fastener joint. Highlights the practical aspects and design methodology applicable to typical joints in industry held in place by rivets, bolts, weld seams, or adhesive materials, among others. Gathers together and coordinates various topics typically treated as separate studies in numerous texts and publications. The design and performance of mechanical and structural joints and interfaces are reviewed and analyzed. Emphasis on practical results and formulas intended for the preliminary design of joints. Includes description and analysis of mechanical joints, threaded fastener joints, riveted joints, welded joints, and adhesive joints. Flanges and stiffeners; coupling and pin connections; and the design of hub and tubular joints. Lect. 3 hrs. *3 hours credit*

**EME5213 MECHANICAL VIBRATIONS**

*Prerequisite: EME3043.* Harmonic oscillations of one and two degrees of freedom linear systems. Damped vibration. Concept of vibration isolation. Multi-degrees of freedom systems. Lect. 3 hrs. *3 hours credit*

**EME5223 ADVANCED MECHANICS OF MATERIALS**

*Prerequisite: EME3013.* Advanced topics in classical strength of materials and the analysis and design of mechanical components. Theories of failure, elasticity, thick-walled cylinders and rotating disks, plate bending, and thin shells. Lect. 3 hrs. *3 hours credit*

**EME5243 FINITE ELEMENT ANALYSIS II**

*Prerequisite: EME4243.* A second course in FEA that introduces higher order elements and focuses on using existing software packages to do class projects. Linear strain triangular, axisymmetric solid elements. Isoparametric formulation, dynamic analysis. Lect. 2 hrs., Lab. 2 hrs. *3 hours credit*

**EME5433 VEHICLE DYNAMICS**

*Prerequisites: EME3043. EME4233 is recommended.* Fundamentals of vehicle dynamics with focus on acceleration, braking, ride and handling, steering, tire dynamics, and vehicle instability (e.g., rollover). Lect. 3 hrs. *3 hours credit*



COOPERATIVE EDUCATION IN  
ENGINEERING

**ECO3001 CO-OP  
PRACTICUM I**

*Prerequisites: Junior standing (60 credit hours), 2.25 LTU GPA, completion of all freshman and sophomore course requirements, departmental approval. First full-time work assignment providing engineering experience in the workplace. Cannot be used for design credit without department chair approval. 1 hour credit*

**ECO3101 CO-OP  
PRACTICUM II**

*Prerequisites: Satisfactory completion of ECO3001, departmental approval. Second full-time work assignment providing engineering experience in the workplace. Cannot be used for design credit without department chair approval. 1 hour credit*

**ECO4001 CO-OP  
PRACTICUM III**

*Prerequisites: Satisfactory completion of ECO3101, departmental approval. Third full-time work assignment providing engineering experience in the workplace. Cannot be used for design credit without department chair approval. 1 hour credit*

**GREENFIELD COALITION**

**Program Manager:**  
Sabah H. Abro

**Lecturers:**  
Additional guest lecturers are assigned to selected courses and sections based on their special ties and expertise, and are listed in the faculty roster.

**GCC1011-1021 BASIC  
CHEMISTRY I-II**

*Prerequisite: GCM1011. The scope of chemistry, chemical reaction/measurement, mass, weight and density, temperature, periodic table, and Factor-Label Method. Includes solutions, acid and base chemistry, redox reactions, energy/enthalpy and Hess' Law. 2 one-credit courses taken in succession.*

**GCC2011-2021  
CHEMISTRY/MATERIAL  
SCIENCE I-II**

*Prerequisites: GCM1011-1041; Co-requisite: 2141. Chemical equilibria and chemical kinetics. Methods for solving complex equilibrium problems; gas phase equilibria; solution equilibria and heterogeneous equilibria. Includes electrochemistry, corrosion and degradation of materials and advanced topics in kinetics. 2 one-credit courses taken in succession.*

**GCE2411-2421  
MANUFACTURING  
PLANNING I-II**

*Prerequisite: GCF1021. An introduction into manufacturing economics, basic concepts of direct and indirect costs, and time value of money. Material requirements planning, basic dynamics of material requirements planning, the basic lot sizing techniques used in MRP, and the difference between MRP and other release control techniques such as Kanban. 2 one-credit courses taken in succession.*

**GCE2261 CONTROL  
ELEMENTS IN  
MANUFACTURING  
SYSTEMS**

*Prerequisite: GCT1221. An overview of control systems and a study of the application of sensors and actuators in control systems, digital logic, and programmable logic controllers. 1 hour credit*

**GCE2461-2471 ENGINEERING  
ECONOMICS I-II**

*Prerequisite: 0. The fundamental and advanced concepts of engineering and economic evaluation of singular or pair-wise manufacturing engineering projects. Economic evaluation of multiple and mutually exclusive projects in manufacturing engineering, and the economic evaluation of multiple and independent projects in manufacturing operation. 2 one-credit courses to be taken in succession.*

**GCF1011-1031  
INTRODUCTION TO  
COMPUTERS IN  
ENGINEERING I-II**

*Prerequisite: GCM1021. Computer basics, operating systems, introduction to computer hardware, word processing, spreadsheets, and Visual Basic. 3 one-credit courses taken in succession.*

**GCF1133 INTRODUCTION  
TO DESIGN GRAPHICS**

*Prerequisites: GCF1011, GCF1031. Introduction to the computer processes used in the design graphics field and the coupling needed between design and manufacturing. Visualization, generation of design geometry using 3-dimensional solids as the geometry primitives, control and utilization of design geometry, the design-graphics process, and the CAD to CAM process including data base type of tracking and validation of processes, including process planning, materials, features, etc. 3 hours credit*

**GCL1011-1031  
FUNDAMENTALS OF  
ENGLISH COMPOSITION:  
ESSAYS AND VISUALS**

*Prerequisite: MTI. The writing process, report writing, memos, letters and editing reports. Applying strategies for locating information using library and computer sources to design and write a research report. Writing essays and designing visuals. 3 one-credit courses taken in succession.*

**GCL1211-1241 PSYCHOLOGY  
WITH SOCIOLOGY I-IV**

*Prerequisites: GCO0990, GCL1021. Methods, learning and memory; physiological and sensory psychology; human growth, development, and personality; and social psychology and sociology. 4 one-credit courses taken in succession.*

**GCL2011-2031  
COMMUNICATIONS IN  
MANUFACTURING I-III**

*Prerequisites: GCL1011, GCL1021. Theories of communication, persuasion, organizational communication, effective communication opportunities and obstacles, and the ethics of communications. Methods of communications, project proposal and technical presentations and an introduction into traditional and non-traditional media presentations. 3 one-credit courses taken in succession.*

**GCL2614 COMPARATIVE  
POLITICS AND ECONOMICS**

*Prerequisite: 0. Globalization issues. Integration of social, political, and economic knowledge for a manufacturing company's expansion in the global market. Modular topics include team building, research strategies, project planning, cultural understanding, comparative political systems, economic development models and comparative economic systems, and political and economic integration methods. 4 hours credit*

**GCM1011-1051 TECHNICAL MATH I-V**

Prerequisite: MTI. Methods of solving quadratic equations, definition of functions, system of two and three linear equations, logarithms and exponents, lines and conics, trigonometric functions and trigonometric relationships; vector algebra. *5 one-credit courses taken in succession.*

**GCM2111-2141 CALCULUS I-IV**

Prerequisite: GCM1051. Differential calculus; limits, derivatives, and derivative rules. Applications of the derivatives and properties of curves. The integral and numerical integration and calculus of transcendental functions. *4 one-credit courses taken in succession.*

**GCM2412,2431 MANUFACTURING STATISTICAL METHODS I-II**

Prerequisites: GCM1011-1041. Multimedia instruction in the use of statistical methods in manufacturing. Problem-solving tools, descriptive statistics, data collections, control charts, process capability and tolerancing systems. Statistical computer packages are used and field studies are required. *1 two-credit and 1 one-credit course taken in succession.*

**GCS2111-2131 MECHANOPHYSICS I-III**

Prerequisite: GCM1051. Introduction to basic physics concepts related to the study of motion and forces, and static equilibrium. Translation and rotation of a rigid body, rigid body rotation, coriolis effect, vectors and motion, velocity and mechanisms, and acceleration and mechanisms. *3 one-credit courses taken in succession.*

**GCS2141 INTRODUCTION TO ENGINEERING MECHANICS**

Prerequisite: GCS2131. Introduction to vibrations of mechanical systems and to the basic concepts of engineering structural analysis. *1 hour credit*

**GCS2211 THERMOSCIENCE**

Prerequisites: GCM1041, GCM2131. Introduction to the properties and laws associated with thermodynamics, fluid mechanics, and heat transfer. Fluid density, pressure, and viscosity; fluids at rest (including Pascal's and Archimedes' principles); conservation of mass; Bernoulli equation; temperature scales; thermal expansion of liquids and solids; specific heats and heats of transformation; the first law of thermodynamics; kinetic theory of gases; and the second law of thermodynamics. *1 hour credit*

**GCS2311-2331 ELECTROSCIENCE**

Prerequisite: GCM1011. Fundamental principles of electrostatics, the concepts of DC-analysis and the study of the functioning of the many devices and everyday applications employing the principles of electromagnetism and/or inductors and capacitors. *3 one-credit courses taken in succession.*

**GCT1111-1121 MACHINING PROCESSES I-II**

Prerequisites: GCF111-1131, GCM1011-1031. Introduction to basic machine tool operations and material removal technology. Topics include process technology associated with material removal, cutting tool mechanics, mathematical process relations, cutting fluids and process planning. *2 one-credit courses taken in succession.*

**GCT1211 FOUNDATIONS OF MEASUREMENTS**

Prerequisite: 0. Presentation of terminology, procedures, and capabilities of devices used in the field of measurement; measurement statistics. *1 hour credit*

**GCT1221 INSTRUMENTATION**

Prerequisite: 0. Instrumentation used in manufacturing environments. Overview of control system terms, discrete/binary signals, multiplexed signals, analog to digital conversion, and a study of programmable logic controllers. *1 hour credit*

**GCT2011-2021 ENGINEERING MATERIALS I-II**

Prerequisites: GCM1011, GCM1021. Developing an understanding of the many types of materials that are used in our technological society. Metals, ceramics, polymers, composites, materials selection and materials for manufacturing. A project is completed on a workpiece of the student's choice. *2 one-credit courses taken in succession.*

**GCT2111-2121 MANUFACTURING PROCESSES I-II**

Prerequisites: GCT1211, GTC1221, GCT2021. Introduction to the issues of product quality and tolerances, manufacturing processes for casting and how the various methods influence secondary operations such as machining and metal forming processes. Manufacturing joining processes which include various types of welding, brazing and soldering and a study of the heat flow in the work place. *2 one-credit courses taken in succession.*

**GCT2181-2191 TOOL DESIGN I-II**

Prerequisites: GCM1021, GCF1131, GCT1121, GCT2021. Tool design methods, tool-work interaction, tool materials and work holding principles, design of drill jigs, design of fixtures, and tool design guide. *2 one-credit courses taken in succession.*

**GCT2313, 2341 MANUFACTURING SYSTEMS I-II**

Prerequisite: 0. Introduction to manufacturing systems design. Fundamentals of manufacturing systems design, graphical analysis tools, mathematical analysis tools, and data communications networks. *1 three-credit and 1 one-credit course taken in succession.*

**GCT2451-2461 ETHICS AND INDUSTRY I-II**

Prerequisite: 0. To be developed. *2 one-credit courses taken in succession.*

**GCT2211-2221 ELECTRICAL MACHINES I-II**

Prerequisite: GCS2321. Introduction to the theoretical and practical knowledge to achieve an understanding of the analysis of DC/AC circuits, industrial electric power specifications, industrial transformers, industrial and special purpose electric machines, and industrial solid state motor controllers and devices. *2 one-credit courses taken in succession.*

**GCT2511 DESIGN PROJECT**

Prerequisite: 50 credits and two job rotations. A design project incorporating fundamentals learned in previous courses. The design process is emphasized from the establishment of objectives and analysis of alternative solutions to a final evaluation and recommendation. Final written and oral report required, and use of manufacturing facility in production of design is encouraged. *1 hour credit*





## DEGREE PROGRAMS OFFERED

Lawrence Tech's College of Management offers these programs:

- Bachelor of Science in Information Technology
- Master of Business Administration
- Master of Science in Industrial Operations
- Master of Science in Information Systems
- Career Integrated – Master of Business Administration
- Doctor of Management in Information Technology
- Doctor of Business Administration

*Note: Additional degree programs in management subjects are offered in the Colleges of Architecture and Design, Arts and Sciences, and Engineering.*

Management is concerned with the planning, implementation, and monitoring activities undertaken by private and public-sector organizations that serve society.

Lawrence Tech's College of Management endeavors to (1) offer students an appreciation of contemporary issues, challenges, and opportunities facing the management community; and (2) provide an in-depth understanding of the processes, systems, and operations of profit and not-for-profit organizations. In doing so, the programs of the College of Management are designed to offer students the concepts, skills, and knowledge needed to function effectively in technical, administrative, and managerial positions including abilities that not only assist in securing employment but lead to steady progress within the organization.

**Dean:**  
LOUIS A. DeGENNARO, M331,  
248.204.3050

**Interim Associate Dean:**  
DAVID ALLARDICE

**Executive Director:**  
**International School**  
CHIN-LING LIN

**Executive Director:**  
**Domestic School**  
LAURA A. MAJEWSKI

**BSIT Director:**  
RICHARD BUSH

**Faculty Members:**  
DAVID ALLARDICE  
BEN BENSON  
PATRICIA CASTELLI  
PETER CHANG  
VERNON HOFFNER  
JAMIE HSU  
ROBERT INSKEEP  
BARBARA KOUSKOULAS  
LELAND A, LAHR  
(Professor Emeritus)

S. ALLAN McCORD  
SRIKANT RAGHAVAN  
JACQUELINE STAVROS  
A. LERINE STEENKAMP

**Senior Lecturers:**  
RICHARD BUSH  
BETSY JENAWAY

**Adjunct Faculty:**  
Additional lecturers are assigned to selected courses and sections based on their particular specialties and expertise, and are listed in the faculty roster.

**Faculty Council:**  
BARBARA A. KOUSKOULAS,  
COUNCIL CHAIR  
VERNON R. HOFFNER  
SRIKANT RAGHAVAN

**College of Management  
Advisory Board:**  
JON ADAMS, MSIS'98  
Injectronics, Inc.  
TINA BOES, MBA'00  
PCI Group

DIANE CAIRNS, MBA'01- PRESIDENT  
PATRICIA CASTELLI, MBA'92  
Lawrence Technological  
University

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Global Engineering Inc.  
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Lawrence Technological  
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MARY ANNE MERUCCI, MBA'98  
Ford Motor Co.  
JOHN MILLER, MBA'92, MSIS'01  
SPX Corp.

MARY PEARCE, MBA'01  
TAMI SALISBURY, BSBA'97  
DARTIS WILLIS, MBA'01  
Lear Corp.  
KIM ZIOMEK-MATTE, MBA'95-  
SECRETARY  
Robert Bosch Corp.

It is the College's goal to develop and enhance leadership capabilities in graduates while instilling in them the importance of education as a life-long process that leads to professional achievement and personal satisfaction. The College recognizes that today's manager faces challenges from strong and growing global economic forces, conflicting values, changing technology in products and processes, and demographic diversity among employees and customers. Therefore, the College is concerned with students' intellectual and cultural growth as well as their educational progress in various fields of study.

**Introduction**—Lawrence Technological University's College of Management has three primary operational objectives with respect to the information, knowledge, skills, and insights necessary to compete in contemporary organizations:

- to instill and develop these skills/insight in students;
- to demonstrate unique applications to managerial problem-solving issues and;
- to contribute to further theoretical/practical developments through applied research.

Foremost is the College of Management's intent to provide a quality learning environment that is rooted in the tradition of teaching and scholarship based on relevant "real world" situations.

More than ever, organizations find themselves operating in a highly competitive and

ever-changing social, political, and economic/technological environment. Continued pressures on profit margins, fewer people responsible for maintaining work schedules, relentless global competition, and the pace of technological innovation are but four challenges facing many organizations today. Establishing long-term objectives and articulating innovative, highly targeted strategies for success are skills which every contemporary manager and leader must possess.

The Lawrence Tech College of Management's programs are designed to enable the student to develop and demonstrate proficiency in these personal and organizational strategies. The seminar-style format utilized at Lawrence Tech allows an open dialogue between the teaching professionals and the predominantly working students. Faculty understand the conflicting demands of balancing academic preparedness, family needs, and full-time employment. This understanding leads to the use of relevant case studies, simulations/class exercises, and guest speakers who can add a greater dimension of expertise to the course materials.

The College of Management is accredited by the Association of Collegiate Business Schools and Programs (ACBSP) and the International Assembly of Collegiate Business Education (IACBE). Since 1998, the College has consistently ranked at the top in a nationwide student satisfaction survey.

## ADMISSION REQUIREMENTS

Unless indicated elsewhere, applicants to the Bachelor of Science in Information Technology (B.S.I.T.) degree program are expected to have earned a high school diploma or GED equivalent and have earned a GPA of 2.00 or higher in academic subjects.

Students may be unconditionally, conditionally or specially admitted to the College of Management and are required to meet a certain performance level to remain in the program. They must then petition for a change of status. Conditionally admitted students have met all general admission requirements while awaiting official documents.

## BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

The B.S.I.T. (Bachelor of Science in information technology) degree is designed with four goals in mind:

1. Provide students with the theoretical concepts necessary for success in industry.
2. Give students hands-on experience using current technologies.
3. Provide students with an employable skill set.
4. Provide industry with highly trained and competent IT professional.

Students in the B.S.I.T. program experience coursework in Database Design, Systems Analysis, Technical Infrastructure, Project Management in an IT Environment, Information Systems Management,

Telecommunications and a myriad of business courses. To enhance the learning experience, class sizes are limited, courses meet once a week and students investigate various information technology topics.

As students approach their senior year, they work with their advisor to customize a concentration that meets their information technology interests. The purpose of this concentration is to allow students the opportunity to apply the theory they have learned in their course work with current technologies available in the work place. Students, therefore, acquire a valuable skill set that can be applied the first day on the job.

The B.S.I.T. degree combines fundamental business concepts with current technologies. This allows students to solve complex business problems by applying the technology learned through their course work. Students develop and/or enhance existing skills in careers such as Network Administration, Systems Analysis, Business Analysis, Systems Programming, Application Support, and Internet related technologies. More importantly B.S.I.T. embraces Lawrence Technological University's commitment to theory and practice; establishing a competitive advantage for the student as they embark upon their careers.

**BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY (B.S.I.T.)**  
**Total Semester Credit Hours: 132**

**Mathematics and Science (18 Credit Hours)**

MCS 1214	Math Analysis 1
MCS 1224	Math Analysis 2
MCS 2113	Statistics
	Natural or Physical Science 1
	Natural or Physical Science 2
	Natural or Physical Science Lab

**English/Communications (7 Credit Hours)**

COM 1001	University Seminar
COM 1103	English Composition
COM 2103	Technical and Professional Communication

**Humanities/Social Sciences (12 Credit Hours)**

LLT 1213	World Masterpieces 1
LLT 1223	World Masterpieces 2
SSC 2413	Foundations American Experience
SSC 2423	Developmental American Experience

**General Electives (18 Credit Hours)**

Any Lawrence Tech undergraduate course with approval of the program coordinator. Jr./Sr. Elective.

**Pre-Technology Courses (9 Credit Hours)**

INT 3053	PC Productivity
MCS 1514	Computer Science 1
MCS 2514	Computer Science 2

**Information Technology Core (30 Credit Hours)**

INT 3023	Information Technology Inaugural
INT 3103	Information Technology Management
INT 3203	Technical Infrastructure
INT 3503	Project Management within an IT Environment
INT 3603	eBusiness Strategy, Architecture, and Design
INT 3803	Database Design and Implementation
INT 4013	Telecommunications and Networks
INT 4023	Exploration of Information Technology Security
INT 4203	Systems Analysis
INT 4303	Physical Design & Implementation within a Programming Environment

**Business Core (15 Credit Hours)**

MGT 3013	Starting New Ventures and Managing Entr. Oper.
HRM 3043	Organizational Development & Change Theory
HRM 3053	Managing Business Relationships
HRM 3063	Team Building and Group Dynamics
MGT 3233	Entrepreneurial Marketing

**Electives/Concentration (15 Credit Hours)**

Lawrence Tech undergraduate courses 3000 or higher (especially MGT/ MCS/INT). Students with permission can take Graduate course work from either the M.B.A. or M.S.I.S. programs to satisfy up to nine credit hours of this requirement.

**Professional Certification Option (9 Credit Hours Optional)**

Students can complete and become certified in an industry certification of their choice. The following list represents the most desirable in the field:

1. Novell Certified Netware Engineer
2. Microsoft Certified Systems Engineer
3. Microsoft Certified Solution Developer
4. Microsoft Certified Database Administrator
5. Microsoft Certified Systems Administrator
6. Microsoft Certified Application Developer
7. CompTIA A+, Network+, IT Project+, and Linux+ (Pick three)
8. CompTIA Master CIW Enterprise Developer
9. CompTIA Master CIW Certification
10. Cisco Certified Network Professional
11. Cisco Certified Professional
12. Oracle Certified Professional
13. Security Certified Program Network Professional
14. Additional certification tracks will be evaluated at the students' request.



**BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

**FRESHMAN YEAR**

FIRST SEMESTER			SECOND SEMESTER		
COURSE No.	SUBJECT	CR. HRS.	COURSE No.	SUBJECT	CR. HRS.
COM1001	University Seminar	1	MCS1224	Intro to Math An1	4
COM1103	English Composition	3	COM2103	Tech/Prof Comm.	3
MCS1214	Intr to Math An1	4	LLT1213	World Masterpcs 1	3
INT3053	PC Productivity	3	MCS1514	Computer Science 1	3
INT3023	IT Inagural	3	INT3103	IT Management	3
		14			16

**SOPHOMORE YEAR**

PSC1113	Physical Science 1	3	PSC1123	Physical Science 2	3
MCS2113	Statistics	3	PSC1131	Physical Science Lab 1	1
LLT1223	World Masterpcs 2	3	SSC2413	Found American Exp.	3
MCS2514	Computer Science 2	3	INT3203	Tech Infrastructure	3
GENXXX3	General Elective	3	GENXXX3	General Elective	3
GENXXX3	General Elective	3	GENXXX3	General Elective	3
		18			16

**JUNIOR YEAR**

SSC2423	Dev American Exp.	3	GENXXX3	General Elective	3
INT3503	PM/IT Environ.	3	GENXXX3	General Elective	3
INT3603	eBusiness Strategies	3	INT3803	Database Des/Impl	3
MGT3013	Starting New Vent. & Managing Ent. Opr.	3	HRM3053	Comm & Managing Relat. for Leaders	3
INTXXX3	Elect/Concentration	3	INTXXX3	Elect/Concentration	3
MGT3233	Entrepreneurial Mktg	3	HRM3043	Org. Dev. & Change Theory	3
		18			18

**SENIOR YEAR**

INTXXX3	Elect/Concentration	3	HRM3063	Team Building & Group Dynamics	3
INTXXX3	Elect/Concentration	3	INTXXX3	Elect/Concentration	3
INT4013	Telecomm/Network.	3	INT4023	Explor IT Security	3
INT4203	Systems Analysis	3	INT4303	Ph Des/Impl Pro Env	3
		12		ICCP Exam (Req'd)	0
					12

For more information about the B.S.I.T. program or to speak with an advisor, contact the College of Management at 248.204.3055 or visit M331 in the Buell Management Building.

**INT3001 CO-OP PRACTICUM I**

*Prerequisites: Junior standing (60 credit hours), 2.25 LTU GPA, completion of all freshman and sophomore course requirements, and departmental approval. First full time work assignment providing information technology experience in the workplace. 1 hour credit*

**INT3023 INFORMATION TECHNOLOGY INAUGURAL**

*Prerequisite: MCS1003.* Introduction to how information is used in organizations and how information technology enables improvement in quality, timeliness and competitive advantage. Systems and development concepts, information technology issues, as well as hardware and software consideration. Lect. 3 hrs. 3 hours credit

**INT3053 PC PRODUCTIVITY**

Improving skills as knowledge workers through effective and efficient use of packaged software. Focus on using the computer to increase productivity. Small systems design and development issues. Coursework completed both on individual and group basis. Lect. 3 hrs. 3 hours credit.

**INT3101 CO-OP PRACTICUM II**

*Prerequisite: Satisfactory completion of INT 3001, and departmental approval. Second full time work assignment providing information systems experience in the workplace. 1 hour credit*

**INT3103 INFORMATION TECHNOLOGY MANAGEMENT**

*Prerequisite: INT3023.* How information is used and managed within organizations. The use of information as a resource, developing and managing information systems, IS planning and implementation, reengineering, end-user computing, information systems strategies, network and telecommunications systems management, electronic commerce and societal and ethical issues relating to information systems design and use. Lect. 3 hrs. 3 hours credit

**INT3203 TECHNICAL INFRASTRUCTURE**

*Prerequisite: INT3023.* Designing a computer architecture that will meet the needs of the business environment. Current hardware, network and software technologies will be explored as well as system architectures for the single user, center, and networked computing systems. Single and multi-user operating systems will also be discussed. Lect. 3 hrs. 3 hours credit





**INT3503 PROJECT MANAGEMENT WITHIN AN IT ENVIRONMENT**

*Prerequisite: INT3023.* The eight basic knowledge areas of project management: scope, time, cost, quality, human resources, communications, risk, and procurement. Students are exposed to the uniqueness of managing these knowledge areas in an information technology environment. The challenges and the advantages of using and creating computer technology in project scenarios. Lect. 3 hrs. *3 hours credit*

**INT3603 eBUSINESS STRATEGY, ARCHITECTURE, AND DESIGN**

*Prerequisite: INT3023.* The linkage of organizational strategy and electronic methods of delivering products, services, and exchanges in inter-organizational, national, and global environments. Information technology strategy and technological solutions for enabling effective business processes within and between organizations in a global environment. Lect. 3 hrs. *3 hours credit*

**INT3803 DATABASE DESIGN AND IMPLEMENTATION**

*Prerequisites: INT3023.* The design and development of relational database management systems (RDBMS). Special attention on the organizational and management issues related to the design and implementation of a RDBMS, data definitions, data manipulation, and normalization. Students develop logical design of the database and then convert their design into a physical model. Also explores implementation issues, Internet technologies, security concerns, testing and installation. Lect. 3 hrs. *3 hours credit*

**INT4001 CO-OP PRACTICUM III**

*Prerequisite: Satisfactory completion of INT3101, and departmental approval.* Third full time work assignment providing information systems experience in the workplace. *1 hour credit*

**INT4013 TELECOMMUNICATIONS AND NETWORKS**

*Prerequisite: INT3023.* In-depth knowledge of data communications and networking. Telecommunications technologies, hardware and software. Special emphasis on the design, implementation and management of local area networks and wide area networks. Network privacy, security and reliability. Lect. 3 hrs. *3 hours credit*

**INT4023 EXPLORATION OF INFORMATION TECHNOLOGY SECURITY**

*Prerequisites: INT3023 and INT4013.* As networks continue to grow and as computing becomes more ubiquitous, today's IT managers need a thorough understanding of the security and risks associated when inappropriate security exist. Explores basic security concepts, principals and strategy, how to develop and maintain an IT security program, and how to strategize and plan an IT architecture. Also discussed are other IT security issues as they relate to current market trends. Lect. 3 hrs. *3 hours credit*

**INT4203 SYSTEMS ANALYSIS**

*Prerequisite: INT3023.* Developing an information system from concept to implementation. Various system development methodology techniques and introduction to the system development life cycle. Special emphasis on developing good communication skills between users, clients, team members and others that are associated with the project. Lect. 3 hrs. *3 hours credit*



**INT4303 PHYSICAL DESIGN AND IMPLEMENTATION WITHIN A PROGRAMMING ENVIRONMENT**

*Prerequisite: INT3023 and INT4203.* The capstone course. Developing an information system from concept to implementation. Various system development methodology techniques and introduction to the system development life cycle. Special emphasis on developing good communication skills between users, clients, team members and others that are associated with the project. Lect. 3 hrs. *3 hours credit.*

**INT4503 PROFESSIONAL CERTIFICATION AND TRAINING**

*Prerequisite: Approval of full-time faculty member and undergraduate program director.* With approval of a faculty member, students complete advanced technical training in an IT related field and successfully pass a certification exam. All training must be American Council on Education (ACE) or Lawrence Tech faculty approved. Programs include: MSCE, CNE, CCIE, Oracle Database or UNIX system administrator. Lect. 3 hrs. *3 hours credit*

**INT4506 AND INT4524 PROFESSIONAL TRAINING - NON EVALUATED**

*Prerequisite: Approval of qualified full time faculty member and undergraduate program director.* Students develop an individual plan of study with a faculty mentor that may include industry seminars, formal course work and self-study. Students complete a portfolio project, INT4992.

**INT4992 PORTFOLIO PROJECT**

*Prerequisite: Approval of qualified full time faculty member and undergraduate program director.* A project is completed that demonstrates the various skills gained while completing a concentration. Students work closely with a faculty advisor during development of this project. *2 hours credit*



**CLASS OF 2005**

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**Larry D. Lyons,**  
Vice President, Small Vehicle Production Team,  
DaimlerChrysler AG

**John G. Petty,** BSME'65,  
Former Director, Fox Land Systems,  
General Dynamics Corp.

**Lloyd E. Reuss,**  
Chairman of the Board, Lawrence Technological University;  
Former President, General Motors Corp.

**James E. Queen,**  
Vice President, Global Engineering,  
General Motors Corp.

**CLASS OF 2006**

---

**Joseph E. Champagne,**  
Chairman, Ross Controls,  
Former President, Oakland University

**Raymond R. Khan,** BSEE'70,  
Former Senior Vice President, and CIO,  
Blue Cross/Blue Shield of Michigan

**Barbara Samardzich,**  
Executive Director, Small FWD & RWD Platform,  
Ford Motor Co.

**David B. Wohleen,**  
Vice Chairman,  
Delphi Corp.

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**Frederick M. Adams, Jr.,**  
Chairman, The Northern Trust Bank

**Lauren L. Bowler,**  
Former Vehicle Line Executive, Midsize/Large Cars,  
Adams Opal AG, General Motors Corp.

**Douglas G. DelGrosso,** BSME'84,  
President and COO,  
Lear Corp.

**Howard B. Padgham,**  
Former Vice President,  
Advance Manufacturing-Engineering Powertrain,  
DaimlerChrysler AG

**EX OFFICIO**

---

**Charles M. Chambers,**  
President and Chief Executive Officer,  
Lawrence Technological University

**ADVISORY MEMBERS OF THE CORPORATION**

---

**Richard H. Cummings,**  
Former Senior Vice Chairman, NBD Bank and  
NBD Bancorp, Inc.

**Edward Donley,** BME'43,  
Former Chairman, Air Products and Chemicals, Inc.

**Esther G. Edwards,**  
Chairman and CEO, Motown Historical Museum, Inc.

**William D. Innes,** BSME'53,  
Former Executive Vice President, Ford Motor Co.

**Julius L. Pallone,**  
President, J.L. Pallone Associates

**Kurt O. Tech,** BSME'48,  
Former Management Consultant; President, The Cross Company

**Sydney L. Terry,**  
Consultant to Business, Government, Industry;  
Former Vice President, Public Responsibility and  
Consumer Affairs, DaimlerChrysler AG

<b>President and Chief Executive Officer</b>	<b>Charles M. Chambers</b>
Executive Assistant to the President	Louise M. Garrett
University Architect	Joseph C. Veryszer
Special Assistant for Pacific Programs	George Shen
Special Assistant for European Programs	
Special Assistant for Canadian Programs	Jacob Lai
Special Assistant for India Programs	Suryaji Bhonsle

<b>Senior Vice President, University Advancement</b>	<b>Stephen C. Ragan</b>
Assistant Vice President for Development	Dennis J. Howie
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Director, Technology Partnerships	Mark J. Brucki
Director, Major Gifts	Tina K. Casoli
Manager, Alumni Relations and Annual Giving	Angela C. Ruth
Manager, Annual Giving and Advancement Services	Chris R. Sanders
Executive Director, Marketing and Public Affairs	Bruce J. Annett, Jr.
Director, Media Services and University Photographer	Walter G. Bizon
Graphic Designer	Sofia S. Lulgjuraj
Managing Editor, News Bureau	Karen M. Sanborn
Manager, University Communications and Academic Editor	Anne M.G. Adamus
Manager, Web Services	Christian Forrester

<b>Vice President, Finance and Administration*</b>	<b>Linda Height</b>
Controller	Grant Wenzinger
Director, Campus Facilities	Carey G. Valentine
Assistant Director, Campus Facilities	Matthieu Maracle
Manager Campus Safety	Harry P. Butler
Lead Security Officer	Jay Monroe
Manager, Personnel Services	DeShawn Johnson
Manager, University Bookstore	Carl Campanella

<b>Executive Vice President, Provost, and Chief Academic Officer</b>	<b>Lewis N. Walker</b>
Associate Provost and Dean, Graduate Programs	Maria J. Vaz
Assistant Provost for Enrollment Management	Lisa R. Kujawa
Director, Admissions	Jane T. Rohrbach
Assistant Director of Admissions	Kristi Webster
Director, Financial Aid and Veterans Affairs	Mark A. Martin
Registrar	Holly A. Diamond
Assistant Registrar	Noreen G. Naeyaert
Coordinator, Institutional Research and Academic Planning	Mary Thomas
Director, Library	Gary R. Cocozzoli
Assistant Director, Library	Marianne Hipp
Director, Continuing Education and Professional Development	Victoria Navarro
Operations and Marketing Manager	Michele Vanootigheim Bialo
Executive Director, IT Service Delivery Organization	William Wachob

Manager, IT Planning & Administration	Charlene Lilla
Assistant Director, Edward Donley Computer Center	Marc Hoedeman
Director, Veraldi Instructional Technology Resource Center	Pamela Lowry
Director, Laptop Help Desk	Marquita Poinsetta

**ADMINISTRATION OF THE COLLEGES**

<b>Dean of Architecture and Design</b>	<b>Glen S. LeRoy</b>
Associate Dean of Architecture and Design	Joseph C. Veryszer
Assistant Dean, Graduate Studies	Virginia North
Chair, Architecture	Edward Orłowski
Chair, Art and Design	Virginia North

<b>Dean of Arts and Sciences</b>	<b>Hsiao-Ping H. Moore</b>
Associate Dean, Arts and Sciences	Glen A. Bauer
Chair, Humanities, Social Sciences and Communication	Betty L. Stover
Chair, Mathematics and Computer Science	David E. Bindschadler
Chair, Natural Sciences	William G. Madden

<b>Dean of Engineering*</b>	<b>Maria J. Vaz</b>
Associate Dean, Engineering	Richard S. Maslowski
Chair, Civil Engineering	Nabil F. Grace
Chair, Electrical and Computer Engineering	Ronald C. Foster
Chair, Engineering Technology	William L. White
Chair, Mechanical Engineering	Steven K. Howell

<b>Dean of Management</b>	<b>Louis A. DeGennaro</b>
Assistant Dean*	David Allardice
Executive Director, Graduate Management Programs	Laura A. Majewski
Executive Director, International Programs	Chin-Ling Lin
Director, BSIT Program	Richard Bush

**STUDENT SERVICES**

<b>Dean of Students</b>	<b>Jerome E. Webster</b>
International Student Affairs Coordinator	Frank E.P. deHesselle
Coordinator, Academic Achievement Center	Diana Richard
Clinical Psychologist, Counseling Services	Robyn Siegel-Hinson
Multi-Cultural Support Services Counselor	Brenda Hildreth
Program Coordinator, Student Affairs	Eula Muckleroy
Director, Career Services	Kevin Finn
Assistant Director, Career Services	Jennifer King
Director, Residence Life	Janielle Ostrowski
Residence Life Coordinator	Pamela Costello
Director, Student Activities	Alan McLaughlin
Assistant Director, Student Activities	Scott Trudeau
Coordinator, Student Activities	Vacant
Manager, Contract Dining Service	Brent Bishop

\*Interim appointment



**ACADEMIC PROGRAM ASSESSMENT**

---

Badih A. Jawad \*  
 Lisa M. Anneberg  
 David E. Bindschadler  
 Donald Carpenter  
 Walter K. Dean  
 Rochelle Martin  
 Laura L. Lisiecki  
 Virginia North  
 Barry Knister

**ACADEMIC STANDING**

---

Jerry L. Crist \*  
 Harold Hotelling  
 Jane T. Rohrback  
 Richard S. Maslowski

**ADDITIONAL CREDIT REVIEW**

---

Glen A. Bauer  
 Richard Bush  
 Harold Hotelling  
 Richard S. Maslowski  
 Noreen Naeyaert (ex-officio)  
 Virginia North  
 Jane T. Rohrback

**CAMPUS LEARNING ENVIRONMENT**

---

William S. Allen  
 Howard Deardorff  
 Louis A. DeGennaro  
 Thomas J. Nashlen  
 James S. Rodgers  
 AIS Student Representative  
 Lewis N. Walker (ex-officio)

**E-LEARNING COMMITTEE**

---

Jacqueline M. Stavros \*  
 Pamela Lowry\*  
 Lisa M. Anneberg  
 Gary R. Cocozzoli  
 David Gregorich  
 Kevin A. Kelch  
 James D. Nanny  
 Victoria Navarro  
 Virginia North  
 Paula Nranian  
 Jennifer Panczak  
 Dan R. Price  
 Patricia M. Shamamy  
 Loran W. Walker  
 Linda S. Wareck  
 Maria J. Vaz (ex-officio)

**FACULTY SENATE**

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Steve Rost  
 Ghassah M. Azar\*  
 Harold Hotelling  
 Faculty Representatives  
 Anthony F. Sky

**FINANCIAL AID AND SCHOLARSHIPS**

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Jerry L. Crist \*  
 Donald F. Condit  
 Maria A. Sipos  
 Jane T. Rohrback  
 Mark A. Martin  
 Richard S. Maslowski

**GRADUATE COUNCIL**

Daniel L. Faoro  
 Valentira Tobos  
 Chris H. Riedel  
 Barbara A. Kouskoulas  
 Maria J. Vaz (ex-officio)  
 Jane Rohrback (ex-officio)  
 Holly Diamond (ex-officio)

**INFORMATION SYSTEMS AND SERVICES ADVISORY COUNCIL**

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Laird E. Johnston \*  
 James E. Abernethy  
 David E. Bindschadler  
 Thomas A. Lackey  
 Srikant Raghavan  
 Maria J. Vaz

**LIBRARY**

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Dane A. Johnson  
 Richard R. Johnston  
 Barbara Kouskoulas  
 Valentina Tobos  
 Gretchen Weiner\*  
 Stewart Winger

**STUDENT ACTIVITIES**

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Alan McLaughlin \*  
 Bruce J. Annett, Jr.  
 Thomas A. Lackey  
 Student Government  
 President

*\*Chairperson*





The two years at the end of each listing indicate first, the year of initial appointment to the University faculty, and second, the year of appointment to the designated rank. The current professional engagements of guest lecturers are also shown. Current names of degree-granting institutions are used.

**KAVEH ABANI**, B.S., 1977, Sharif University of Technology; M.S., 1979, University of Detroit; Ph.D. (in progress), Wayne State University. *Lecturer in Mathematics and Computer Science, 2003, 2003.*

**JAVAD ABDOLLAHI-ALIBEIK**, M.S., 1993, Ph.D., 1994, University of Michigan. *Lecturer in Mathematics and Computer Science, 2000, 2000.*

**JAMES ABERNETHY**, AIA; RA; B.Ar., 1964, University of Detroit Mercy; M.U.P., 1972, Wayne State University. *Professor Emeritus of Architecture, 1974, 2005.*

**SABAH H. ABRO**, B.S., 1971, University of Baghdad, M.S., 1980, University of Wales, Ph.D., 1987, Universite de Louvain. Focus: HOPE. *College Professor of Engineering Technology, 2000, 2000.*

**ANIRBAN ADHYA**, B.Arch., Bengal Engineering College; M.Arch., University of Buffalo. *Lecturer in Architecture, 2004, 2004.*

**EUDORA ADOLPH**, M.S.E.E. 1991, Kettering University; M.B.A., Indiana University. *Lecturer in Mechanical Engineering and Humanities, 2001, 2001.*

**PARVIZ AHMADI**, B.S.E.E., B.S.Eng.Ma., 1982, M.S.E.E., 1985, University of Michigan. Chrysler Corporation. *Lecturer in Electrical Engineering and Physics, 1984, 1984.*

**FATHALI AKBARIAN**, B.S., 1986, University of Science & Arts of Oklahoma; M.S., 1992, Oakland University. *Lecturer in Mathematics and Computer Science, 2001, 2001.*

**MAZIN AL-HAMANDO**, B.Arch., University of Baghdad; M.S. Arch. Eng., M.S. Ind. Eng. and Mgmt. Systems, Penn State University. *Lecturer in Mathematics and Computer Science, 2003, 2003.*

**DAVID R. ALLARDICE**, B.S., 1967, M.S., 1969, Ph.D., 1974, Colorado State University. *College Professor in Management, 2003, 2003.*

**WILLIAM S. ALLEN**, ASLA; RLA; B.L.A., 1971, University of Michigan. *Professor of Architecture, 1973, 1995.*

**DAW R. AL-WERFALLI**, B.S.M.E., 1972, Al-Fateh University; M.S.Textiles, 1978, Georgia Institute of Technology; M.E.Mfg., 1981, D.E., 1989, University of Detroit Mercy. *Professor of Mechanical Engineering, 1990, 2002.*

**KUSSIY K. ALYASS**, B.S., 1977, University of Baghdad, Ph.D., 1984, Wayne State University. *Lecturer in Mathematics and Computer Science, 2000, 2000.*

**THOMAS ANDERSON**, B.A., 1980, M.A., 1988, Ph.D., 1991, Wayne State University. *Lecturer in Humanities, 1998, 1998.*

**DONALD ANDREWS**, A.B., Math, Physics, 1959, Eastern Michigan University. *Lecturer in Mathematics and Computer Science, 1987, 1987.*

**LISA M. ANNEBERG**, PE; B.S., 1979, University of Michigan; M.S., 1983, Ph.D., 1991, Wayne State University. *Associate Professor of Electrical Engineering, 1991, 1995.*

**LAVETTA APPLEBY**, B.S., 1991, M.S., 1996, Michigan State University. *Senior Lecturer in Chemistry, 1996, 1996.*

**FRANCIS J. ARLINGHAUS**, B.S., 1962, University of Detroit Mercy, Ph.D., Massachusetts Institute of Technology. General Motors (retired). *Lecturer in Mathematics and Computer Science, 1984, 1984.*

**WILLIAM C. ARLINGHAUS**, B.S., 1964, University of Detroit Mercy; Ph.D., 1979, Wayne State University. *Professor of Mathematics and Computer Science, 1985, 1991.*

**MARY ARNOLD**, B.A., 1971, Wayne State University. *Lecturer in Humanities, 2002, 2002.*

**NAJI ARWASHAN**, B.S.E., 1987, University of Damascus, M.S.E., 1988, Ecole Nationale des Ponts et Chaussees, Ph.D., 1992, University of Michigan. LTV Steel. *Lecturer in Civil Engineering, 1999, 1999.*

**JOSEPH R. ASIK**, B.S., 1959, Case Institute of Technology; M.S., 1961, Ph.D., 1966, University of Illinois. Ford Motor Company. *Lecturer in Electrical and Mechanical Engineering, 1978, 1978.*

**GLADYS M. AVILES, B.S.**, 1984, University of Puerto Rico; Ph.D., 1989, Wayne State University. *Lecturer in Chemistry, 1998, 1998.*

**AMED AWAD, B.S.C.E.**, 1995, M.S., 1991, Cairo University; M.S. 1997, Ph.D., Construction Management, 2001, Wayne State University. *Lecturer in Civil Engineering, 2004, 2004.*

**GHASSAN M. AZAR, B.A.**, 1982, M.S., 1986, Ph.D., 1992, Wayne State University. *Senior College Professor of Computer Science, 2000, 2000.*

**ANTHONY L. BAN, B.S.Ar.**, 1972, Lawrence Technological University, Schonsheck, Inc. *Lecturer in Civil Engineering, 1996, 1996.*

**SURESH C. BANSAL, P.E.**; B.S.M.E., 1963, Punjab University; M.S.M.E., 1968, Ph.D., 1977, Wayne State University. *College Professor of Mechanical Engineering, 1997, 1997.*

**DAVID L. BARCZYS, AIA; RA;** B.S.Arch, 1980, University of Detroit Mercy; M.Arch., 1984, University of Illinois. *Lecturer in Architecture, 1999, 1999.*

**MIAH BASET, B.S.E.E.**, 1973, University of Chittagong; M.S.E.E., 1983, West Virginia University. Ford Motor Company. *Lecturer in Electrical and Computer Engineering, 2001, 2001.*

**DINO BASKOVIC, B.S.**, 1997, Kent State University. *Lecturer in Humanities, 2001, 2001.*

**GLEN A. BAUER, B.S.**, 1977, M.A., 1979, Wayne State University. *Associate Professor of Mathematics and Computer Science, 1982, 1993.*

**GREGORY M. BAUGHMAN,** B.S.L.A., 1979, Michigan State University. *Lecturer in Architecture, 2003, 2003.*

**SAMUEL R. BAYNE JR.**, B.S.Arch., 1972, M.Arch., 1973, University of Michigan. *Lecturer in Architecture, 1992, 1992.*

**ALI BAZOUN, B.S.**, 1981, M.S., 1983, Wayne State University. DaimlerChrysler AG. *Lecturer in Mathematics and Computer Science, 1991, 1991.*

**ERIC BEAN, B.S.**, 1985, Grand Valley State University; M.A., 1995, Michigan State University. *Lecturer in Humanities, 2004, 2004.*

**BENJAMIN B. BENSON,** B.B.A., 1983, University of Michigan; M.A., 1984, University of Detroit; Ph.D., 1988, Wayne State University. *College Professor in Management, 2004, 2004.*

**LESTER BERMAN, PE;** B.S.C.E., 1970, M.S.C.E., 1978, Wayne State University. U.S. Department of Housing and Urban Development. *Lecturer in Architecture, 1979, 1979.*

**STEPHEN BERTMAN, B.A.**, 1959, New York University; M.A., 1960, Brandeis University; Ph.D., 1965, Columbia University. *Lecturer in Humanities, 2002, 2002.*

**SURYAJI (STEVE) BHONSLE,** B.S.E. Civil Engineering, 1960, Utah State University; M.S. Structural Engineering, 1962, New Mexico State University; Ph.D. Engineering Mechanics, 1968, Michigan Technological University. *College Professor in Mechanical Engineering, 2003, 2003.*

**JOHN P. BIGGAR, B.S.Arch.**, 1987, Lawrence Technological University; M.Arch., 1989, University of Illinois. *Lecturer in Architecture, 2001, 2001.*

**DAVID E. BINDSCHADLER,** B.S., 1970, Ohio State University, M.S., 1973, Indiana State University, Ph.D., 1976, Indiana University. *Associate Professor of Mathematics and Computer Science, 1999, 1999.*

**NATHAN BLACKBURN,** B.S.C.E., 2000, M.S.C.E., 2001, Lawrence Technological University. Comprehensive Structural Services. *Lecturer in Civil Engineering, 2001, 2001.*

**MONIER BOTROS, B.S.M.E.**, 1967, University of Cairo; M.S.M.E., 1988, PH.D.M.E., 2000, Wayne State University. Visteon. *Lecturer in Mechanical Engineering, 2004, 2004.*

**JOHN BOYSE, A.S.**, 1960, Bay City Junior College; B.S.E.Math., 1963, University of Michigan; M.S.E.E., 1964, University of Michigan; Ph.D., Computer Information and Control Engineering, 1971, University of Michigan. *Lecturer in Electrical and Computer Engineering, 2004, 2004.*

**LUDGER BRINKER, A.M.**, 1979, Clark University, M.A., 1980, M.A., 1981, University of Freiburg, Ph.D., 1991, University of Massachusetts. *Lecturer in Humanities, 1998, 1998.*

**MICHAEL BROWN, B.S.Arch.**, University of Detroit. *Lecturer in Architecture, 2003, 2003.*

**VERNA BROWN, B.B.A.**, Cleary University; M.B.A., Carnegie and Chadwick University. *Lecturer in Humanities, 2003, 2003.*

**SCOTT BUCK, B.S.**, 1989, Lawrence Technological University; B.S.C.S., 1992, Wayne State University. U.S. Army Tacom. *Lecturer in Engineering Technology, 1994, 1994.*

**RICHARD G. BUSH, B.A.**, 1999, M.A., 2001, Spring Arbor University. *Senior Lecturer in Information Systems, 2002, 2003.*

**ALAN BYRNES, B.S.**, 1996, Wayne State University. *Lecturer in Mathematics and Computer Science, 2001, 2001.*

**MICHAEL CANTEBERRY,** B.A., Michigan State University; M.L.A.; University of Michigan. *Lecturer in Architecture, 2001, 2001.*

**DONALD D. CARPENTER,** B.S.C.E., 1993, Purdue University; M.S. Ocean Engineering, 1996, Oregon State University; Ph.D., 2001, University of Michigan. *Assistant Professor in Civil Engineering, 2001, 2001.*

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