

# Kettering University

## Undergraduate Catalog 2014 – 2015

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This catalog was published for the 2014-2015 academic year.  
University Policies and Procedures are subject to change.

All dates noted apply to both undergraduate and graduate classes - unless otherwise noted

Term	Week	Month	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Dates and Events	
		Jul	6	7	8	9	10	11	12		

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## ABOUT KETTERING UNIVERSITY

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### Mission, Vision and Values

#### Mission

Kettering University prepares students for lives of extraordinary leadership and service by linking transformative experiential learning opportunities to rigorous academic programs in engineering, science, mathematics, and business.

#### Vision

Kettering University will be the first choice for students and all our partners seeking to make a better world through technological innovation, leadership and service.

#### Values

*Respect:* for teamwork, honesty, encouragement, diversity, partnerships with students.

*Integrity:* including accountability, transparency and ethics.

*Creativity:* fostering flexibility and innovation.

*Collaboration:* across disciplines and with all partners.

*Excellence:* in all we do.

### Accreditation

Kettering University has been accredited since 1962 by [The Higher Learning Commission](#) and is a member of the North Central Association of Colleges and Schools.

The programs in Chemical Engineering, Computer Engineering, Electrical Engineering, Engineering Physics, Industrial Engineering, and Mechanical Engineering are accredited by the Engineering Accreditation Commission (EAC) of [ABET](#).

The program in Applied Physics is accredited by the Applied Science Accreditation Commission (ASAC) of [ABET](#).

The program in Computer Science is accredited by the Computing Accreditation Commission (CAC) of [ABET](#).

The Business program was accredited in 1995 by the Association of Collegiate Business Schools and Programs ([ACBSP](#)).

### History

Kettering University's name honors Charles Kettering (1876-1958), a distinguished engineer, inventor, scientist, social philosopher and humanitarian. Charles Kettering believed that both theoretical knowledge and practical experience are necessary elements of an education. This belief made him an advocate for cooperative education in the earliest years of the twentieth century. Our founders were among those influenced by Kettering's advocacy. From our earliest years our students have benefited from moving back and forth between the practical requirements of work experience and the disciplined reflection fostered in an academic environment.

We trace our origins to 1919 as the School of Automotive Trades, a school that provided night classes for factory workers in the growing automotive industry in Flint, Michigan. Under the leadership of Albert Sobey, the school became the Flint Institute of Technology in 1923. In 1924 Sobey created the school's first cooperative education program permitting alternating periods of full-time academic work and full-time work in local factories in a four-year program.

Recognizing the potential of cooperative education to educate its engineers and managers, General Motors Corporation took over the institute in 1926 and changed the name to General Motors Institute. In 1945, General Motors Institute added a senior thesis requirement and became a degree-granting college while maintaining its full cooperative education program.

General Motors divested itself of ownership in 1982. Though fully independent of General Motors, we maintained part of our old name until 1998, GMI Engineering and Management Institute. As an independent private college we expanded the number and types of companies employing our co-op students, added master's degree programs, established new majors and replaced GM financial support with tuition, donations and endowment income.

In changing our name to Kettering University in 1998, we carry the name of a man whose life represents who we are. Charles Kettering was famous for his technical knowledge and inventions, was fascinated by ideas, respected human imagination and believed that service was the purpose of education. We honor his legacy with our cooperative education program, student-centered learning, faculty scholarship and preparation of students to be leaders in service to their professions and to society.

## Non-Discrimination Policy Statement

Kettering University, as an equal opportunity/affirmative action employer, complies with all applicable federal and state laws regarding nondiscrimination and affirmative action.

Kettering University is deeply committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, national origin, age, marital status, sex, sexual orientation including gender identity or expression, disability, religion, height, weight, genetic information, or veteran status in employment, educational programs and activities, and admissions except where religion, sex, or age are bona fide job related employment requirements.

Discrimination on the basis of race/ethnicity, color, ancestry, religion, national origin, sex, including marital status, age, disability, or status as a Vietnam-era veteran, special disabled veteran, recently separated veteran or other protected veteran is prohibited by federal and state statutes as amended, including Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Pregnancy Discrimination Act of 1978, the Age Discrimination in Employment Act of 1978, the Vietnam Era Veteran's Readjustment Assistance Act of 1974, the Americans with Disabilities Act of 1990, and the Civil Rights Act of 1991.

Inquiries or grievances may be addressed to the Director of Human Resources, Office of Human Resources, 1700 University Avenue, Flint, MI 48504, 810-762-9500.

## Learning Outcomes

In keeping with its mission, core values, and goals, Kettering University strives to ensure that graduates of its baccalaureate degree programs achieve the following learning outcomes:

- **Communication** – the ability to communicate effectively both orally and in writing
- **Critical thinking** – the ability to reason logically, challenge assumptions, evaluate evidence, use evidence to support a position, and creatively apply knowledge to new situations
- **Quantitative reasoning** – the ability to use mathematical models, concepts, and skills to draw conclusions and solve problems
- **Science** – a knowledge of basic laboratory science and the principles of scientific reasoning
- **Foundation in the liberal arts** – a broad knowledge of the perspectives, content and methods of inquiry, and reasoning in the humanities and social sciences
- **Depth of knowledge in a major field of study** - the content, connections to other disciplines, methods, and distinctive professional requirements of a specific discipline
- **Global awareness** – a knowledge of global societies, respect for other cultures, and the ability to interact effectively across cultural boundaries
- **Teamwork** – the ability to work effectively as a member of a team
- **Leadership** – the ability to provide vision, set direction, and motivate others to follow
- **Ethics** – a knowledge of one's ethical responsibilities as an individual, a professional, a member of society, and a commitment to their fulfillment
- **Professionalism** – the habits, characteristics, and skills necessary to have a responsible and productive career
- **Entrepreneurial Mindset** – the habits and skills necessary for creative and innovative thinking, awareness of customer needs, and opportunity recognition
- **Lifelong learning** – the habits and skills to sustain and direct lifelong learning, and an appreciation of its importance

## Campus

### Facilities

The seven main buildings, Academic Building, Campus Center, the Connie & Jim John Recreation Center, C. S. Mott Engineering and Science Center, Frances Willson Thompson Hall, the Innovation Center and the University Corner Building, are set off by an attractively landscaped 85-acre campus. In addition, 85+ acres are available for future development.

The Academic Building is the “historical” center of the campus. It houses classrooms, science laboratories, computer laboratories, the library, the Humanities Art Center, McKinnon Theatre, and instructional and administrative offices, comprising a total floor space of nearly 400,000 square feet.

The Campus Center is the “activity” center for the campus. It houses Kettering Dining Services, Sunset C-Store, BJ’s Lounge & Grill, the Wellness Center, television studios, WKUF, Financial Aid, Admissions, Campus Safety, recycling center, student activities areas and other administrative offices.

Kettering’s 70,000 square-foot Connie and Jim John Recreation Center, located just west of the Thompson Residence Hall, has a full complement of aerobic, strength, and sports amenities, in addition to student and alumni lounges, making it the likely focus of many student and alumni social and recreational activities. It houses a six-lane swimming pool, four multi-purpose regulation basketball courts, four racquetball courts, and a 1/8 mile suspended indoor track. Other areas include an aerobics/dance room, a free-weight room, and a fitness/exercise room that overlook the pool and gymnasium.

The C. S. Mott Engineering and Science Center has a total floor space of 130,000 square feet. The building houses Biochemistry, Chemistry, Mechanical Engineering, and alternative energy and automotive laboratories. Student project areas are provided, including the SAE garage.

Frances Willson Thompson Hall is the on-campus residence facility for Kettering University. The facility has four floors, and is designed in a figure eight formation with two courtyards. It is divided into 17 units of 17-37 residents. Common spaces include multiple lounges/lobbies, computer labs, a community kitchen, a gaming area and laundry facilities. Each resident room is equipped with a single bed, desk and chair, wardrobe unit with shelves, and with a micro fridge and microwave. All rooms are air conditioned, heated and have access to telephone, cable and internet. Most residents share a suite with another resident (two private rooms connected by a door). Residents share community bathrooms, which are located at the intersections of each hallway.

Campus Village Apartments, although not Kettering-operated, are located on Kettering property, and provide suite-style housing for over 200 upper-class students. Students wishing to explore the Campus Village living option should call the Campus Village rental office at (810) 232-4960.

The Innovation Center at Kettering University is an approximately 9,000 sf. multi-tenant laboratory facility that supports scientific and technologically-based “start-up” companies that have a need for dedicated research laboratories in the first three to four years of their existence. It consists of six laboratories that are capable of being divided into twelve intimate laboratories, private offices, a conference/training room, business center, break area and private shower facilities. The Innovation Center is the first Leadership in Energy and Environmental Design (LEED) Silver Certified building in Genesee County.

In addition to the food and catering services provided from the Campus Center, students and the surrounding community have the option of eating at Einstein Bros. Bagels in the University Corner Building across the street from the Campus Center. The 2,500 square-foot building also houses a Flint Police Service Station.

Kettering facilities are accessible to the handicapped. The majority of the campus buildings are inter-connected for ease of movement during inclement weather. Convenient parking is provided adjacent to all campus buildings.

### Harris Fields

Harris Fields, adjacent to the Recreation Center, is the 25 acre sports complex for use by Kettering students. The rectangular portion contains areas for two soccer fields or two flag football fields or two lacrosse fields. This section is lit by Musco Lighting, the premier sports lighting company in the world. Softball can be played on 4 fields, complete with backstops and crushed limestone infields. Lacrosse and soccer also utilize the outfields for club practices and games. Informal play, the popular IM Sports program and club sports all utilize Kettering Park. Students, faculty and staff are also active on the .62 mile (1K) walking/jogging path that circumscribes the sports fields.

The McKeachie picnic pavilion is a covered picnic area that features picnic tables, barbeque grilles, lighting and electrical power for student reserved or informal use. Adjacent to the pavilion are two sand volleyball courts that are very popular with students for IM play and pick up games. A synthetic grass golf green completes the outdoor recreational opportunities for students.

Numerous trees and shrubs have been planted and the complex is fenced in and the area bordering University Avenue features faux wrought iron fencing and brick columns offering a distinctive look to one of the entrances to campus. The entire complex provides a first class venue for student recreation.

The Flint River Trail is a paved trail running along the Flint River from downtown Flint to the northern edge of Flint and on to either Bluebell Beach or Stepping Stone Falls. The trail is almost continuously asphalt and is suitable for walking, jogging, and/or biking and passes through the Kettering campus.

#### **Atwood Stadium**

Atwood Stadium has been an iconic landmark in the city of Flint for the past 85 years. Built on an old city dumpsite that was cleared by 3000 local volunteers in a single day, it sits right in the heart of the Flint community. Atwood has played host to many high school football games, including the Flint Northern/Flint Central series. It has also been the venue of choice for large-scale community events, such as visits from President Franklin Delano Roosevelt in 1936 and presidential candidate John F. Kennedy in 1960. Today, activities include all levels of youth football, health fairs, band competitions, and 10k road races.

In September 2013, Kettering University stepped up to the plate and assumed ownership of the venerable stadium in order to keep the facility from closing. Kettering is committed to maintain the traditional uses of the stadium in addition to providing a new venue for Kettering student recreational and academic events. Fundraising has already started to enable major upgrades to the facility including a new high-tech synthetic playing surface to replace the outdated existing AstroTurf.

#### **The Kettering University Alumni Carillon (Bell Tower)**

The Bell Tower also called Carillon was erected as a part of the campus expansion in 1969, built with funds donated by GMI/Kettering Alumni and friends.. At the dedication, it was noted that the structure would “serve as a dynamic symbol of identity between the alumni, students, and faculty”. The carillon consists of 47 bells arranged in four octaves. The largest bell weighs nearly one ton while the smallest bell weighs only 20 pounds. The bells, made of 75 percent copper and 25 percent tin, were cast by the 200-year-old Petit & Fritsen Foundry of Aarle-Rixtel Netherlands. Designed by Tarapata-McMahon-Paulson Associates, the Kettering Carillon received the 1971 Honor Award for design from the Detroit Chapter of the American Institute of Architects.

## ADMISSIONS

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Admission to Kettering University is competitive. Kettering's [Office of Undergraduate Admissions](#) evaluates student credentials to determine who is best qualified to pursue a degree in any of the STEM (science, technology, engineering and mathematics) or business programs offered at the university. Emphasis is placed on the applicant's overall academic record, including their grades in core academic courses (English, science and math) and scores on college entrance exams. However, Kettering uses a holistic approach to admission, so consideration is also given to the student's personal essay, extracurricular activities, letters of recommendation, employment history and other evidence of achievement and motivation. Kettering does not discriminate by reason of race, color, sex, creed, age, physical challenge or national origin.

Applicants must possess a high school diploma or recognized equivalency. They should have achieved high scholastic standing – especially in science, mathematics and English. Applicants for freshman admission must have completed sixteen credits in a college preparatory program for grades nine through twelve. Credits given in eighth grade for ninth grade algebra and recorded on their official high school transcript may be used as one credit of algebra.

### Scholastic Preparation

To be eligible for admission, a student must complete the following courses prior to enrollment:

English:	Six semesters required (eight semesters recommended)
Mathematics:	Algebra – four semesters Geometry – two semesters Trigonometry – one semester
Science:	Four semesters of science with lab including two semesters of either Chemistry or Physics. Both are strongly recommended.

We encourage all applicants to complete English, science, and math courses beyond these minimum requirements. Training and experience in mechanical drawing, computer aided design (CAD) and personal computers are also recommended.

Beyond these minimum requirements, Kettering does not have a fixed formula for determining admission. However, a strong record of academic achievement is expected. A separate GPA will be calculated for English, math and science coursework for all students. Additional review may be required for any high school courses completed online.

## College Entrance Examinations

Applicants for freshman admission are required to present scores for either the SAT or ACT. Scores should be sent directly to Kettering University from the testing agency. Students are encouraged take either examination during their junior year and again in the fall of the senior year. Kettering University will “super-score” all test results. Students for whom English is a second language are strongly encouraged to present the results of the Test of English as a Foreign Language (TOEFL). Kettering's ACT code is **1998**, and our CEEB code for the SAT and TOEFL is **1246**.

## Freshman Applicants

Students are encouraged to [apply online](#). Kettering University is a member of the Common Application. Students may apply using either the Common Application at [www.commonapp.org](http://www.commonapp.org) or Kettering University's [application](#). Applicants must then request official transcripts and supporting information from their high school guidance offices. All post-secondary institutions attended should be listed regardless of intention to transfer credits to Kettering. If you have any questions regarding the application process, please call the Office of Undergraduate Admissions at 810-762-7865.

Early application – in the fall of senior year of high school – is encouraged to maximize the student's visibility in the cooperative and experiential education employment search process. High school seniors are encouraged to apply by the dates listed at [www.kettering.edu/admissions](http://www.kettering.edu/admissions). However, Kettering University offers rolling admission and students may apply at any time during the year. Their completed application, official transcripts, test results and supplemental materials – including personal essay and recommendation letter – must be received in order for processing and evaluation to occur. All credentials submitted become part of a permanent file at Kettering University. They cannot be returned to the applicant nor forwarded to any other institution.

Enrollment is contingent upon satisfactory performance in, and completion of, all senior-level courses in which the student is enrolled. Final high school and college transcripts must be submitted to the Office of Undergraduate Admissions. Failure to do so

will affect your ability to register for classes. Applications for admission are valid for one year; students applying to Kettering University, but not enrolling, may request reactivation of their application during that time.

## Home School Student Applicants

Kettering University welcomes home schooled students to [apply for admission](#). Applicants must submit the same application materials and meet the same admission requirements as any other high school student. Students should submit a completed application, standardized test scores, personal essay, letter of recommendation, and an official transcript developed by a home school association or by the primary teacher.

All transcripts should include: course name, credit and final grade for all 9-12 grade courses, graduation date, and a signature affirming that the transcript is the official record of academic studies. If any high school credit was earned in a formal high school setting or college, the applicant must also supply an official transcript from the respective school. Courses taken online or through correspondence programs should be similarly documented. For evaluation purposes we encourage clear documentation and explanation of all English, math, and science courses. The Office of Undergraduate Admissions will contact the student's primary educator if additional information is needed.

Please note that all materials sent as part of the application become the property of Kettering University and will not be returned to the student. Final transcripts showing a high school graduation date and/or final college transcripts must be submitted by all incoming students. Failure to do so will affect your ability to register for classes.

## International Student Applicants

Students who reside outside of the United States are welcomed to apply for admission to Kettering University. International students should [apply online](#). Admission decisions will be based on academic achievements in secondary school or university studies. International students must submit at least one of the following test results: SAT, ACT, Test of English as a Foreign Language (TOEFL), or International English Language Testing System (IELTS). TOEFL or IELTS results are required from students whose native language is not English, or who did not attend a school where English was the language of instruction.

Certified copies of transcripts/educational certificates and records with English translations must be sent to World Education Services (WES) at [www.wes.org](http://www.wes.org) for evaluation when the application for admission to Kettering University is submitted. A secondary school/university-level grading scale may also be requested. All international students must provide a financial plan for tuition, a personal essay, and one letter of recommendation before a final admission decision can be determined. Kettering University does offer a limited number of scholarships to international students.

### Immigration Information: F-1 Student Visa Applicants

Admitted international students will receive an I-20 form with their official letter of admission. All international students are required to present the I-20 when applying for an F-1 Student Visa and again at their port of entry into the United States. Applicants enrolled at another U.S. institution with an F-1 Student Visa must be released from the Student & Exchange Visitor Program (SEVIS) by their current institution before Kettering University can issue a new I-20 form.

### Co-op Employment of International Students

Degree seeking international students are required to participate in Kettering's cooperative and experiential education program. Students may secure co-op employment in the U.S. or in their home country. As is the case for domestic students, international students are responsible for work term living expenses, transportation and any personal expenses.

## Transfer Student Applicants

Kettering University is transfer-friendly and encourages students with prior college experience to [apply for admission](#). Students who have taken **any** college courses after graduation from high school are considered transfer students.

Transfer students must submit official transcripts from all colleges/universities attended. Additional information, such as high school transcripts or SAT/ACT scores, may also be required from students who have completed less than 30 credit hours. A list of courses in progress and the catalog(s) with course descriptions from each college attended may also be requested.

Kettering University has formal articulation agreements with more than 40 colleges/universities, ensuring the transferability of approved courses upon their satisfactory completion. Students who successfully complete the equivalent of the first two years of Kettering courses are generally able to complete their Kettering University degree and associated co-op work experiences within three years.



### Scholastic Preparation

To be eligible for admission to Kettering University, transfer students must complete the following courses prior to enrollment (some of these requirements could have been completed at the high school level):

English:	Six semesters required (eight semesters recommended)
Mathematics:	Algebra – four semesters Geometry – two semesters Trigonometry – one semester
Science:	Four semesters of science with lab including two semesters of either Chemistry or Physics. Both are strongly recommended.

### Academic Requirements for Transfer Students

Beyond the above minimum scholastic requirements, Kettering does not have a fixed formula for determining admission. However, a strong record of academic achievement is expected. Primary consideration is given to the applicant's overall grade point average and number of credit hours taken. A separate GPA will also be calculated for English, mathematics and science coursework. Secondary consideration is given to the student's employment history, extracurricular activities and honors, and other evidence of ability, achievement and motivation.

A typical transfer student will have pursued 14-16 credit hours per semester of coursework similar to what is taken by a Kettering University student. Candidates who have not pursued full-time collegiate study and/or followed a program that does not include the extensive study of mathematics and science will be evaluated individually on their high school and college records and their ACT/SAT test scores.

Prospective transfer students should maintain an overall grade point average of at least a "B," with strong math and science grades – again of at least a "B" or better. Kettering University offers rolling admission and students may apply at any time during the year.

### Suggested Courses

Transfer courses should reflect a strong background in math and science and can include general education classes common to undergraduate degree programs.

Kettering University	Course Name
• CHEM-135/136	Principles of Chemistry/Lab
• COMM-101	Written & Oral Communication I (Composition & Speech)
• ECON-201	Economics (Micro or Macro)
• HUMN-201	Introduction to the Humanities
• MATH-101	Calculus I (Differential Calculus)
• MATH-102	Calculus II (Integral Calculus)
• PHYS-114/115	Newtonian Mechanics/Lab
• PHYS-224/225	Electricity and Magnetism/Lab
• SSCI-201	Introduction to the Social Science
•	History, Literature, Philosophy, etc. (must be taken at the 300 level or greater)

### Transfer Credit Evaluation

Courses submitted for transfer credit should be comparable in content and difficulty to those offered at Kettering University. Applicants must provide official transcripts and may be required to provide the Registrar's Office with a college course catalog, course syllabi, or additional information for evaluation purposes. Applicants will be contacted with the results of the credit evaluation.

### Transfer of Experiential and Cooperative Education Work Experience

Transfer students entering Kettering with less than Junior 1 (JR1) standing who have participated in another comparable college-level cooperative and experiential education program or those who have significant work experience related to their Kettering University degree program may be eligible to transfer these experiences towards their co-op degree requirements. Students should contact the Cooperative and Experiential Education Office at 810-762-9846 to determine the documentation necessary to transfer a maximum of two work terms (only applicable toward freshman-sophomore requirements).

## Additional Requirements for Admitted Students

### Math Placement Examination

The [Mathematics Placement \(MP\) Examination](#) is required of all incoming freshmen and transfer students, unless they have received transfer credit, Advanced Placement or International Baccalaureate credit for Kettering's intro calculus course, MATH-101.

### Enrollment Deposit

In order to confirm enrollment to Kettering University and hold their seat in the class, all admitted students must submit a \$300 enrollment deposit. This money will be credited towards tuition (\$200) and as a \$100 housing deposit. The enrollment deposit is fully refundable until May 1.

### Medical Information

Prior to enrollment, all students must complete a Health and Medical Information form. All medical information is treated confidentially and cannot be released without the student's knowledge or written consent. The Kettering University Wellness Center uses this information to create a continuous record of student health care.

Kettering does not require a medical examination prior to enrollment. Some co-op employers may require such an exam as a condition of employment or due to particular working conditions.

### Cooperative and Experiential Education Employment Process

Accepted students are eligible to begin the co-op employment search process late spring of their senior year of high school, students need to have an approved resume and are encouraged to work with their assigned Co-op Manager/Educator. The Cooperative and Experiential Education Office may begin forwarding the resumes of deposited applicants to potential co-op employers starting as early as January. Careful attention is given to the student's objectives, needs and preferences, as well as to employer criteria.

Companies choose to interview applicants based on academic performance, class rank, employment history and extracurricular activities and honors. Factors influencing final selection include communication skills, leadership potential, a desire for a career in the industry, and the capacity to acquire the necessary academic and practical background for a future position of responsibility. Information concerning the interviewing process is available from the Cooperative and Experiential Education Office at 810-762-9846.

## International Baccalaureate Credit

Applicants seeking International Baccalaureate (IB) credit should have an official IB transcript sent directly to Kettering's Office of Undergraduate Admissions. Credit will be granted for passes at the "IB Standard Level" (SL) in Computer Science only. Credit will be issued for passes at the "IB Higher Level" (HL) according to the IBO table below. Kettering University awards credit for IB scores of 5, 6 or 7 for physics, mathematics and biology when the full IB diploma has been earned.

IBO Exam	Required Score	Credits Granted	Kettering Course Number
Biology (HL)	6 or 7	4	BIOL-241 & 242
Chemistry (HL)	5, 6 or 7	4	CHEM-135 & 136
Computer Science (HL)	5, 6 or 7	8	CS-101 & 102
Computer Science (SL)	5, 6 or 7	4	CS-101
English (HL) and History (HL)	6 or 7	4	SSCI-201
Foreign Language – Any (HL)	5, 6 or 7	4 or 8	LANG-297
Mathematics (HL)	5, 6 or 7	4	MATH-101
Physics (HL)	6 or 7	4	PHYS-114 & 115
Sociology (HL)	6 or 7	4	SSCI-201

## Advanced Placement Credit

Applicants who have completed Advanced Placement (AP) courses are encouraged to take the College Board AP Examinations. This chart indicates the scores needed to receive Kettering University credit. Students should have an official AP transcript sent to Kettering directly from the College Board AP Program. AP credits do not override prerequisite requirements.

Advanced Placement Exam	Required Score	Credits Granted	Kettering Course Number
Art History <sup>1</sup>	4,5	4	ART-297
Art Studio 2-D Design <sup>1</sup>	4,5	4	ART-297
Art Studio 3-D Design <sup>1</sup>	4,5	4	ART-297
Biology <sup>2</sup>	4,5	3 and 1	BIOL-141 & 142
Calculus AB	3,4,5	4	MATH-101
Calculus AB Subgrade	3,4,5	4	MATH-101
Calculus BC	3	4	MATH-101
Calculus BC	4,5	4 and 4	MATH-101 & 102
Chemistry	4,5	3 and 1	CHEM-135 & 136 or CHEM-137 & 136
Comparative Government and Politics <sup>1</sup>	4,5	4	SSCI-297
Computer Science A	4,5	4	CS-101
English Language and Composition <sup>1</sup>	4, 5	4	COMM-297
English Literature and Composition <sup>3</sup>	4, 5	4	HUMN-201
Environmental Science <sup>2</sup>	4,5	4	BIOL-297
European History <sup>4</sup>	4,5	4	SSCI-201
Foreign Language and Culture <sup>1</sup> – Any	4,5	4	LANG-297
Human Geography <sup>4</sup>	4,5	4	SSCI-201
Macroeconomics <sup>5</sup>	4,5	4	ECON-201
Microeconomics <sup>5</sup>	4,5	4	ECON-201
Music Theory <sup>1</sup>	4,5	4	MUS-297
Physics C, Part I-Mech	4,5	3 and 1	PHYS-114 & 115
Physics C, Part II-E&M	4,5	3 and 1	PHYS-224 & 225
Psychology <sup>1</sup>	4,5	4	SSCI-297
Statistics <sup>2</sup>	3,4,5	4	BUSN-226
U.S. Government and Politics <sup>1</sup>	4,5	4	SSCI-297
U.S. History <sup>1</sup>	4,5	4	HIST-297
World History <sup>4</sup>	4,5	4	SSCI-201

<sup>1</sup>Course counts as a free elective in all degree programs.

<sup>2</sup>Seek department advisement for the curriculum requirement application.

<sup>3</sup>This AP course can count as LIT-297 (Free Elective) if student already has credit for HUMN-201.

<sup>4</sup>This AP course can count as SSCI-297 (Free Elective) if student already has credit for SSCI-201.

<sup>5</sup>This AP course can count as ECON-297 (Free Elective) if student already has credit for ECON-201.

## Admission of Non-degree Seeking Students

### Non-degree Students (Guest students at Kettering University)

Kettering University offers exceptional high school students an opportunity to experience university academics at our nationally recognized university through the State of Michigan guidelines for early enrollment or dual enrollment programs. To enhance this opportunity, substantial scholarships are awarded.

Kettering University welcomes students who wish to enroll in specific courses for their own enrichment or for transfer to other degree programs. Students enrolled in other institutions may demonstrate their eligibility by presenting a certified guest application from their home institution. Students should submit the approved guest application to the Office of the Registrar at least two weeks prior to the start of the term. Non-degree students receive transcripts and full academic credit for courses successfully completed. However, not more than 72 hours of such credit may be accepted for enrollment in a regular degree program. Non-degree enrollment is limited to two courses each term. Contact the Registrar's Office for more information, [registrar@kettering.edu](mailto:registrar@kettering.edu) or 810-762-7476.

### **Early Enrollment**

This program is available to any 11th and 12th grade student who meets Kettering's registration requirements listed below. The student/parent is responsible for all costs associated with early enrollment at Kettering University. No application fee is required. Two courses per term are allowed.

### **Dual Enrollment**

This program is available to qualified students in the 11th or 12th grade who meet Kettering's registration requirements listed below. Through dual enrollment, the student's high school pays a portion or all of the tuition. State guidelines and the high school determine the course eligibility and the amount of tuition the high school is responsible to pay. No additional fees (application fees, etc.) are charged by Kettering University. The student/parent is responsible for any additional costs not paid by the high school. Admission to this program is for fall (October - December) and winter (January - March) terms only. Two courses per term are allowed.

### **Dual/Early Enrollment Registration Requirements**

The following must be submitted for course registration:

- High School transcript with 3.2 G.P.A.
- Completed application and registration form.

Registrations are approved by the Registrar and based on available space.

### **Dual/Early Enrollment – Scholarship**

A scholarship is awarded to a student who is admitted to Kettering University as an early or dual enrollment student.

- Scholarship awards for the 2013/2014 academic year will reflect a tuition reduction to 508/credit hour.
- Scholarship awards will not exceed four Kettering classes per student.

### **Dual Enrollment Worksheet**

The cost of attending Kettering University for the 2014/2015 academic year will be:

Four Credits	
Kettering Tuition .....	\$4,932
Less Scholarship .....	- 2,712
Net Kettering Cost (tuition)† .....	2,220
Less High School Payment .....	(varies when applicable)
Total Student Payment Responsibility* .....	\$ XX

† Includes student access to Kettering University's Recreation Building, Library and Tutoring Services. Fees are waived. Does not include books/supplies.

\* Check or credit card remittance of student portion of tuition due when student certification form is submitted.

Questions about admission of non-degree seeking students including early/dual enrollment can be directed to the Office of the Registrar at [registrar@kettering.edu](mailto:registrar@kettering.edu) or 810-762-7476.

## FINANCIAL AID

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### Financial Aid Policies

#### Required Forms

- Free Application for Federal Student Aid (FAFSA).
- Other documentation required for federal verification as requested.

#### Deadline Dates

- In order to be considered for all available awards, freshmen applicants are encouraged to apply by February 15 and continuing students are encouraged to apply by March 1.
- All required documents must be submitted to the Financial Aid Office in a timely manner. Loan applications will be processed, need-based grants will be credited to accounts, and FWS (Federal Work Study) will be initiated once all documents requested for verification are submitted. Verification must be completed before or during at least half-time attendance; failure to do so will result in the loss of eligibility.
- Scholarships and grants are credited to student accounts according to the schedule on the award letter. Loans are credited after checks are endorsed and promissory notes are signed as needed. Earnings from on-campus employment are paid on a biweekly basis.
- Students may contact the Financial Aid Office in Room 4-700 CC between the hours of 8:00 a.m. and 5:00 p.m. (Monday - Friday) for specific details regarding eligibility, application procedures, deadlines, and required documents.

In addition to cooperative education earnings, there are three basic types of financial assistance for students: gift aid, loans and campus employment. While these are described below, the Kettering University Website contains detailed information about these awards.

### Gift Aid Sources

- **Federal Pell Grant** : The amount of Federal Pell Grant funds that a student receives is based on the number of credit hours the student enrolls for and his or her Expected Family Contribution as determined by the Federal Methodology needs analysis formula.
- **Federal Supplemental Educational Opportunity Grant (SEOG)** may be awarded by the Kettering University Financial Aid Office to undergraduate students who demonstrate exceptional financial need.
- **Michigan Competitive Scholarships**: Awarded by the Michigan Department of Education. The scholarships are based on academic requirements and financial need. Students must initially qualify for the scholarship before enrolling as college freshmen. The scholarship is renewable for a maximum of ten semesters, with renewal based on continued need and satisfactory academic progress. Recipients must file the Free Application for Federal Student Aid (FAFSA) each year prior to the State of Michigan deadline of March 1.
- **Endowed Scholarships**: *Some scholarships are open to a wide spectrum of students, while others have specialized criteria. Questions regarding eligibility, scholarship guidelines, and the application process and deadlines should be directed to the Financial Aid Office. A full listing and general descriptions may be accessed online at <https://www.kettering.edu/financialAid/upperclass-scholarships>*

### Loan Assistance

- **Federal Direct Subsidized Loan**: A need based, low interest loan for students. The amount that a student may borrow is based on his or her grade level and amount of financial need. The annual loan maximums based on the student's grade level are as follows: Grade level 1 - \$3500; Grade level 2 - \$4500; Grade level 3-5 - \$5500; Graduate students - \$8500. Repayment of the loan begins six months after the borrower ceases to be a half-time student. An origination fee is deducted from the approved loan amount prior to disbursement. This fee is subject to change.
- **Federal Direct Unsubsidized Loan**: A non-need based loan for students. A student must apply for a subsidized Federal Direct Stafford/Ford Loan before requesting an unsubsidized loan. The combination of subsidized and unsubsidized loans borrowed may not exceed the student costs and the annual limits of the William D. Ford Federal Direct Loan Program. In addition to the subsidized loan maximums listed above, students considered to be dependent can apply for an additional amount of \$2,000 per academic year. Students considered Independent can apply for

additional amounts through the unsubsidized program as follows: Grade level 1 - \$4,000; Grade level 2 - \$4,000; Grade level 3-5 - \$5,000; Graduate students - \$12,000. The interest rate is variable with a cap of 8.25% and is the borrower's responsibility. An origination fee is deducted from the approved loan amount prior to disbursement. This fee is subject to change.

- **Federal Direct PLUS Loan:** A non-need based loan that is available to the parents of dependent students. The parent borrower must have a favorable credit history. The amount that a parent may borrow is based on the student's educational costs, minus any other financial aid received. The student does not need to apply for other types of need based financial aid, but is encouraged to do so. The interest rate is variable with a cap of 9% and must be paid by the parent. Repayment of the loan begins on the date of disbursement. An origination fee is deducted from the approved loan prior to disbursement. This fee is subject to change. Note: If a parent is denied a PLUS Loan due to an unfavorable credit decision from the Direct Loan Servicer, the Dependent student can access the higher amounts available to Independent students through the Unsubsidized Federal Direct Stafford Loan Program listed above.
- **Alternative Student Loan Programs.** These programs are intended to provide students and their families an alternate source of loan funds to assist in meeting the cost of postsecondary education. Contact the Financial Aid Office for further details.

## On-Campus Student Employment

**Federal Work Study (FWS)** is a program that assists Kettering University in providing on-campus employment for students with demonstrated need.

**Campus employment** is available on a limited basis to students without financial need who would like to earn money toward educational cost while attending school.

## Satisfactory Academic Progress (SAP)

In order to maintain financial aid eligibility, you must make Satisfactory Academic Progress (SAP) toward obtaining a degree. Satisfactory Academic Progress will be monitored at the end of each academic term whether or not you have received financial aid. This policy applies to all federal, state, and university funded grants, along with some alternative loans.

### Minimum standard requirements:

- **Qualitative Measure (GPA that a student must achieve at each evaluation):** Must maintain a cumulative grade point average (GPA) of at least 2.0 at the end of each academic term.
- **Quantitative Measure (Pace of progression to ensure completion within the maximum time frame):** Students must successfully earn 67 % of all credits attempted during an academic term. An "I" will be calculated as no credit until it reverts to a letter grade and is posted to the student's academic record.
  - **Credits attempted** are defined as all classes for which a student receives a passing grade ("D" or better), or an "F", "W" or "I".
  - **Credits completed** are defined as all classes for which a student receives a passing grade of "D" or better.
  - **Audit credits** do not count as credits attempted or completed.
  - **Repeated Courses** count as credits attempted during each term the student is enrolled in the course; however they will be counted once as credits completed the first time a passing grade is received for the course.
  - **Transfer Credits** count towards the quantitative measure.
- **Maximum Time Frame to Complete a Degree:** The maximum allowable timeframe for receiving aid is equal to 150 percent of the length of your academic program. If you are a transfer student, your accepted transfer coursework will be counted in the maximum timeframe.

### Financial Aid Warning

Students who fail to meet the minimum standards for satisfactory academic progress at the end of the academic term will be placed on financial aid warning. A student may continue to receive financial aid for one semester while on financial aid warning. Students should use this opportunity to re-establish satisfactory academic progress.

If, at the end financial aid warning period, the student is meeting the minimum requirements for satisfactory academic progress, the financial aid warning is lifted.

Students who fail to make satisfactory academic progress after the financial aid warning semester will be ineligible for financial aid. You may appeal this status. If your appeal is approved, your financial aid eligibility will be reinstated, and you will be placed on Probation for one term. If your appeal is denied, your financial aid will be suspended for the next academic term.

### **Financial Aid Probation**

To be on Financial Aid Probation you would have to successfully appeal not making Satisfactory Academic Progress after a Financial Aid Warning term. Student may receive aid for one more academic term if appeal is granted.

If, at the end financial aid probation period, the student is meeting the minimum requirements for satisfactory academic progress, the financial aid probation is lifted.

Students who fail to make satisfactory academic progress after the financial aid probation semester will be ineligible for financial aid and placed on Financial Aid Suspension.

### **Financial Aid Suspension**

If the financial aid office determines that you have not met the Minimum Standard Requirements to receive Financial Aid, and your appeal is denied you will not be eligible to receive aid for your next period of enrollment.

### **Appeal**

If extenuating circumstances exist which caused a student to fail to meet one of the above standards, a written appeal may be submitted. Examples of extenuating circumstances include, but are not limited to: unexpected death or major hospitalization of an immediate family member, extended hospitalization or medical condition of student, house fire victim of a violent crime. The appeal should address and document these extenuating circumstances AND include:

- Why you failed to make Satisfactory Academic Progress
- What has changed that will allow you to make Satisfactory Academic Progress during your next academic term

The appeal form is available on the Financial Aid Website. The appeal form must be turned into the Financial Aid Office within thirty days of the notification that you are not meeting Satisfactory Academic Progress. Appeals must include supporting documentation. Incomplete appeals or those missing adequate documentation are typically denied.

Those suspended due to attempting credits more than the 150% of the program are not eligible for appeal.

## **Withdrawing from Courses**

Financial aid is based on the number of credits for which students are enrolled at the end of the refund period. Students who are not registered for full-time at that point will have aid reduced accordingly. Students are encouraged to meet with a financial aid advisor prior to making withdrawal decisions.

## **Withdrawing from Kettering**

For financial aid purposes there are two types of withdrawals: complete and unofficial.

- Complete: Official withdrawal from the University by the student.
- Unofficial: Federal financial aid regulations consider a student to be an unofficial withdrawal if the student receives all fail (E) grades or a combination of all fail (E) and withdraw (W) grades for the term.

## **Student Fails to Earn a Passing Grade in any Class**

**Never Attended:** If a student receives a grade of an F due to not attending class, Federal Title IV aid will be adjusted for those classes never attended.

- Example: A student is in four classes which are all four credit classes. The student receives three A grades and one F grade. The instructor reported that the student never attended the class that received the F grade. Aid will be adjusted from 16 credits (full time) to 12 credits (three-quarter time).
- Example: If a student receives only the following grades (F or W) without one passing grade. If attendance has not been achieved up through the 60% point of the semester, a calculation is done to determine the amount of the Title IV funds that the student has earned at the time of withdrawal.

**Why do we monitor students receiving all 'F' grades?**

The school is obligated by federal regulation to review aid recipients receiving all 'F' grades. The assumption behind the law is that a student receiving all 'F' grades walked away from the semester without properly withdrawing from the University. Schools must identify students with 'F' grades within 30 days from the date final grades are posted.

**Withdrawing Prior to Completing 60% of Term**

Unless a student completes 60% of the term in which federal aid was disbursed, the student will be required to return all or part of the financial aid disbursed in the term. This applies to students who have officially (including medical), or unofficially withdrawn.

**Student Financial Aid Enrollment Requirements**

Kettering University is a semester-based University with two semesters. Each semester consists of an academic term and a work term.

- July-December is a semester (includes summer and fall terms).
- January-June is a semester (includes winter and spring terms).

Student aid, by law, is paid in semesters. Therefore, students who participate in non-standard enrollment (for example, attending school for two terms July-December and then working January-June) may experience decreased financial aid eligibility.

- Enrollment patterns that will not affect aid eligibility for traditional A-section students include the first and second examples on the chart below.
- Enrollment patterns that will not affect aid eligibility for traditional B-section students include the third and fourth examples on the chart below.

In summary, enrollment patterns that create problems include two academic terms within one semester.

**Acceptable Academic Enrollments to Receive Financial Aid**

Summer	Fall	Winter	Spring	
X		X		Traditional A
X			X	A/B
	X		X	Traditional B
	X	X		B/A

**NOTE:** Students may, according to special needs by their employer, follow other patterns of academic/co-op terms. Students wishing to work three consecutive work terms may do so but will be listed inactive (not a student) for one of the three terms. A student must demonstrate progress toward a degree by attending two academic terms within a given year. Send a written request to the Registrar if interested in pursuing this option.

**Financial Suspension**

Failure to meet financial obligations or agreements with Kettering University may result in financial suspension. Financial suspension, determined by the Business Office, includes suspension from portions of or all privileges to which active students are entitled. Two privileges include issuance of transcripts and processing of current and future course registrations.



## TUITION AND FEES

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### Expenses

The current tuition, fees, and charges are listed below. The Student Accounts Office will send an e-mail notification one month prior to the term to your Kettering e-mail when your official bill is ready to view on Banner Web/Self Service. All tuition and fees are due by the beginning of each academic term and all financial aid arrangements must be made by the end of the first day of classes.

To help you meet expenses, we have teamed with Nelnet Business Solutions (NBS, formerly known as FACTS Management Company) to enable you to more easily budget your education expenses and expanded the e-Cashier Tuition Payment Plan (hereafter, "*e-Cashier*"). *e-Cashier* gives you the option of monthly payments to help make the cost of higher education as affordable as possible.

*e-Cashier* offers a variety of online payment options, including payment in full or monthly budget payments over 2 to 6 months. Payments are processed via a credit card or automatic bank payments from checking or savings accounts. There is no fee on a payment in full when drawn from your checking or savings account. If, however, you elect to make payment in full using the credit card option, your full payment along with a 2.5% convenience fee is charged to the Visa, Discover, MasterCard, or American Express credit card you designate.

*e-Cashier* gives you a convenient, interest-free way to budget education expenses. Instead of having to pay the tuition at the beginning of each term or going into debt, you may budget tuition and other expenses over 2 to 6 months per term. Because *e-Cashier* is not a loan program, there is no debt, no credit search, and no interest or finance charge assessed by NBS on the unpaid balance. The only cost is a \$25 per term non-refundable enrollment fee to enroll in a payment plan (if, however, you elect the credit card option, your monthly payment along with a 2.5% convenience fee will be automatically charged to the credit card you designate).

Please visit [e-Cashier](#) for information on a variety of online payment options including payment in full or monthly budget payments over 2 to 6 months. The payments will be automatically deducted from whichever account you choose. A \$300 late fee will be added to all accounts which have not been settled in full by 4:00 p.m. fourth week Friday of each academic term. Financial aid is available for students with a demonstrated need; sources of aid are discussed in the Financial Aid section of this catalog. **NOTE: International Students** – Payment in full of the total balance due must be made by 4:00 p.m. third week Friday of each academic term. Students who do not comply with this policy will be dropped and separated from the university. **The separated students' visa program will be terminated in SEVIS by fourth week Wednesday.**

### Tuition

For purposes of determining financial aid, a full academic load at Kettering University is considered to be 15 credit hours. Kettering University has a fixed rate tuition and fee plan for full-time students that began with the 2012-2013 academic year. Simply put, Kettering students and their parents will be able to rely upon the tuition rate at the University remaining level for the remainder of each student's full-time study at Kettering. And the tuition rate is inclusive of all tuition-related University fees.

Our reason for "fixing" tuition was simple – to take away the guesswork involved in college costs. The Kettering fixed tuition plan means that college costs for the entire program are predictable. Rather than giving you a quick one year peek at college costs, we give to you the complete picture. While other universities will no doubt raise tuition every year – creating significant cost increases over the time to a degree – at Kettering those costs will remain stable.

Simultaneously, we are affirming our commitment to providing superb undergraduate programs in science, technology, engineering, mathematics and business with a rigorous experiential education component. All of us at the University are dedicated to ensuring that every element of your education here is rooted in excellence – whether that be in the classroom, the laboratories, or on the playing fields and in the gym.

The following provides you with a listing of all fees and tuition rates which will be in effect at Kettering University during the 2014-15 school year, which runs from July 2014 through June 2015:

### **Tuition**

Full-time, 15-22 credit hours, per term	
Entering Class 2014-2015 .....	18,490
Returning Students 2013-2014.....	17,800
Returning Students 2012-2013 and Prior.....	16,973
Part-time, less than 15 credit hours, or overload in excess of 22 credit hours, per credit hour	
Entering Class 2014-2015 .....	1,233
Returning Students 2013-2014 .....	1,187
Returning Students 2012-2013 and Prior .....	1,132

### **Room and Board**

Room Rate	
Entering Class 2014-2015.....	2,210
Returning Students 2013-2014 and Prior, per term .....	1,660
Board Rate (meal plan), per term .....	1,410

### **Business-Related**

Exchange Student Enrollment, per term .....	250
NSF Check Processing .....	25
Student Identification Card Replacement.....	10
*Student Insurance, per year .....	1,260
Late Payment Fee.....	300
Enrollment Deposit	
(\$200 applies toward tuition charges and \$100 housing deposit) .....	300

\*The University requires students to submit proof of health insurance each academic year, or to purchase Kettering's Accident and Sickness Insurance Plan.

## **Refund Rates**

### **Tuition, Room & Board, and Fees**

The following schedule of tuition and room and board refunds applies for students who separate from Kettering University before the end of an academic term. These percentages also apply to those taking individual courses when dropping classes reduces their total credit hours to part-time status (less than 15 credits), or from overload to full-time status (15-22 credits).

First Week.....	100%
Second Week.....	75%
Third Week.....	50%
Fourth Week.....	25%
Fifth Week.....	0%

Refund rates are calculated through Friday of fourth week.

Enrollment Deposit is non-refundable after May 1.

## STUDENT LIFE

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### Student Conduct: Behavioral Standards

#### Ethics in the University

The mission of Kettering University rests on the premise of intellectual honesty; in the classroom, the laboratory, the office, and at the examination desk. The very search for knowledge is impaired without a prevailing ethic of honor and integrity in all scholarly, professional, and personal activities. The principles of honor and integrity make it possible for society to place trust in the degrees we confer, the research we produce, the scholarship we present and disseminate, and the critical assessments we make of the performance of students. In order to achieve our goals of preserving, disseminating, and advancing knowledge, Kettering University expects all members of the community to be open to new ideas, to be governed by truthfulness, and to be considerate of the rights of others. We strive to foster these values in all our endeavors and will employ all possible means to discourage dishonest behavior in any form. We hold students accountable for their choices and actions through the Code of Student Conduct, administered by the Vice President of Student Life & Dean of Students.

#### Academic Integrity

We believe fairness, openness, and intellectual honesty to be the keystones of our educational mission. We foster these qualities in all our endeavors and use all possible means to discourage dishonesty, in any form. All members of the Kettering community should report academic dishonesty to the appropriate faculty person, as well as to the Vice President of Student Life & Dean of Students. Academic dishonesty prohibited at Kettering includes, but is not limited to, the following forms:

##### Cheating

Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.

##### Fabrication

Intentional and/or unauthorized falsification or invention of any information or citation in an academic exercise.

##### Facilitating Academic Dishonesty

Intentionally or knowingly helping or attempting to help another to engage in academic dishonesty in any form.

##### Plagiarism

Intentionally or knowingly representing the words, ideas, or images of another as one's own in any academic exercise.

Students found to have carried out any form of academic dishonesty are subject to the faculty member's scrutiny and sanctions, as well as Judicial Affairs' policies and procedures.

#### Kettering Code of Student Conduct

The Kettering University Code of Student Conduct represents a body of behavioral standards for all students. These standards are strictly and vigorously enforced by Kettering University to ensure members of this educational community a productive, safe, and equitable environment for growth and development. Kettering University students are expected to conduct themselves as mature individuals while on campus, at home, and in their work-section communities.

Students are expected to comply with all University regulations governing student conduct and the use of University property and facilities. Kettering University has the right to take action and investigate any offense that involves our students, either as victims reporting or students accused of violating the Code of Student Conduct or any federal, state, and/or local laws/ordinances. The Code of Student Conduct extends to students at their places of co-op employment. We expect students to honor their co-op employer's standards for workplace demeanor and may impose our Judicial Affairs procedures upon any student charged by an employer with workplace misconduct.

#### Code of Student Conduct

Conduct for which students may be subject to judicial action falls into, but is not limited to, the following categories:

- Endangering people or their property.
- Obstructing the normal functions of Kettering University or a co-op employer.
- Theft or damage to property, including intellectual property, of Kettering University, a co-op employer, or any individual.
- Any willful damage to the reputation or psychological well-being of others.
- Threatening, intimidating, harassing, coercing, or verbally abusing another.
- Any physical violence directed at any member of the Kettering University community or a co-op employer's.
- Unauthorized entry to, use of, or occupancy of Kettering University facilities or a co-op employer's.

- Any dishonesty, cheating, forgery, plagiarism, or alteration of, or misuse of Kettering University documents, records or identification, or a co-op employer's.
- Computer misuse, while on academic or work term, at the University or at co-op employment, including but not limited to:
  - Theft or other abuse of computer operations.
  - Unauthorized entry into a file to use, read, or change the contents, or for any other purpose.
  - Unauthorized transfer of a file or files.
  - Unauthorized use of another individual's identification and/or password.
  - Use of computing facilities to interfere with the work of another student, faculty member, or university official.
  - Use of computing facilities to send obscene or abusive messages.
  - Use of computing facilities to interfere with the normal operation of the University's or a co-op employer's computer system.
- Violation of applicable public laws while on Kettering University owned property, University or student-sponsored or supervised functions, a co-op employer's owned or controlled property, or at a co-op employer-sponsored or supervised function.
- Possession or use on campus or at a place of co-op employment of firearms, explosives, explosive fuels, dangerous chemicals or other dangerous weapons, except as specifically authorized by Kettering University or a co-op employer.
- Use, possession, or distribution of narcotics or controlled substances except as expressly permitted by law.
- Possession or use of alcohol on Kettering's campus; any underage possession or use of alcohol.
- Failure to comply with directions of Kettering University or co-op employer officials acting in performance of their duties.
- Conduct which adversely affects the student's suitability as a member of the Kettering University and/or co-op employment communities.

#### **Student Rights and Responsibilities Provided by Kettering's Judicial Affairs Procedures**

Any student accused of any violation of Kettering University's Code of Student Conduct will be extended the following rights and responsibilities:

- Formal, written notification of all charges to be heard at either an Administrative Hearing or a University Board of Student Conduct.
- Right to a timely hearing. The University has the right to establish deadlines for hearing a case, as well as hear a case in a student's absence should s/he fail to appear at the established time and place.
- Opportunity to review the judicial file which will be presented at an Administrative Hearing or University Board of Student Conduct.
- Time to prepare a defense. Students will receive at least 48 hours' notice of the time and place of an Administrative Hearing or University Board of Student Conduct.
- Right to be present at an Administrative Hearing or University Board of Student Conduct.
- Right to have an advisor present at an Administrative Hearing or University Board of Student Conduct. The advisor must be a member of the Kettering University community and may advise the accused student, but may not conduct the student's defense.
- Right to ask questions of any witnesses who appear at an Administrative Hearing or University Board of Student Conduct.
- Right to present defense witnesses whose presences has been requested, in writing, at least 48 hours prior to an Administrative Hearing or University Board of Student Conduct.
- All hearings will be closed. Hearing results will be held in confidence, except that the Vice President of Student Life & Dean of Students may determine that other Kettering University officials ought to be aware of the results, and will inform them.
- Crime victims will be notified of hearing results, in accordance with existing federal, state, and local laws.

Kettering University has the right to request a student return to campus during a work- or off-term in order to expedite a case perceived as serious and pressing in nature. Students are entitled to the rights afforded by the [Family Educational Rights and Privacy Act \(FERPA\)](#).

#### **Resolution Options**

##### **Administrative Hearing**

In cases where charges do not appear to merit suspension or expulsion, or in cases which the accused does not contest the charges, the Vice President of Student Life & Dean of Students may designate an Administrative Hearing Officer (AHO), usually the Chief Student Judicial Officer. The AHO will investigate the case and conduct a hearing with the accused. Administrative Hearings accommodate all those rights and procedures accorded to students by the

University's judicial policies. Following the hearing, the AHO will provide the student with written notification of the results of the hearing, as well as information about the appeals process.

### **University Board of Student Conduct**

The Vice President of Student Life & Dean of Students designates a Judicial board, or University Board of Student Conduct (UBSC) whenever charges may result in suspension or expulsion, including all cases involving academic misconduct. In these cases, the Chief Student Judicial Officer of the University chairs the UBSC, comprised of a minimum of three members of the Kettering community and including representatives from faculty, staff, and students. The Chief Student Judicial Officer investigates the charges and prepares the case for presentation to the UBSC. All presentations include resolution options. The UBSC makes recommendations to the Vice President of Student Life & Dean of Students, who may endorse, alter, or dismiss them.

### **Other Resolution Options**

The Vice President of Student Life & Dean of Students may, after consultation with the involved parties, provide other avenues of resolution, including mediation and/or conciliation.

### **Administrative and Judicial Board Hearings Decisions**

All decisions will be based only on documents, testimony, and evidence presented at administrative and judicial board hearings.

### **Judicial Affairs Sanctions**

The University has the right to enforce a variety of sanctions upon students who are found to have violated the Code of Student Conduct. They include, but are not limited to, the following:

#### **Creation of a Judicial File**

The University applies this sanction whenever the Chief Student Judicial Officer or other hearing officer[s] uphold charges against a student for violating the Kettering Code of Student Conduct, yet it appears that interviews and counseling associated with the pre-hearing and hearing are sufficient to deter further violation. The Chief Student Judicial Officer creates an official file detailing the student's offense.

#### **Judicial Warning**

A Judicial Warning consists of a formal, written notice that the student has violated the Code of Student Conduct and that any future violation will result in more serious consequences.

#### **Restitution and/or Fines**

When a violation of the Code of Student Conduct results in costs to other students, Kettering University, or others, a student may be required to make restitution and/or pay a fine. The University applies fines to community endeavors.

#### **Community Service**

This sanction requires students to contribute a fixed number of hours, without compensation, to benefit the University or the local community. The University retains the right to require that students complete community service with particular organizations it specifies.

#### **Judicial Probation**

Judicial probation implies a medial status between good standing at Kettering, and suspension or expulsion. A student on Judicial Probation will be permitted to remain enrolled at Kettering University under certain stated situational conditions, depending on the nature of the violation and the potential learning value that may be derived from such conditions. Usually, Judicial Probation extends over a stated period, during which it is clearly understood that the student is subject to further disciplinary action, including suspension or expulsion, if the student violates the terms of probation or in any way fails to conduct him/herself as a responsible member of the Kettering University community. Judicial Probation serves as a final warning to the student to re-evaluate and modify his/her unacceptable behavior. Students on Judicial Probation will not be allowed to represent the University in any formal manner and may not serve in a student leadership position during the period of probation. Knowledge of a student's Judicial Probation status may be made known to others at the University on a need-to-know basis.

#### **Interim Suspension and/or Altered Privileges**

Kettering imposes interim suspension when it appears the accused poses a threat to him/herself or others at the University. It may also be imposed following allegations of sexual or physical assault, drug use and/or distribution, threats of violence, etc.

The Vice President of Student Life & Dean of Students or designate may alter or suspend the privileges/rights of a student to be present on campus and/or to attend classes for an interim period prior to the resolution of a judicial proceeding. Decisions of this sort will be based upon whether the allegation of misconduct appears reliable and

whether the student's continued presence reasonably poses a threat to the physical or emotional condition and/or well-being of any individual, including the accused student's. Interim suspension may also be imposed when the accused student's continued presence appears to disrupt the University's regular or special functions, or threatens the safety or welfare of university property.

Interim suspension and/or altered privileges remain in effect until a final decision is made on a pending incident. The Vice President of Student Life & Dean of Students or designate may repeal interim suspension or altered privileges at his/her discretion.

### **Suspension**

Suspension—an involuntary separation of a student from Kettering University—implies and states a time for return to the university. Suspension may extend for a school and/or work term, for a specified period, until a specified date, or until a stated condition is met. A University Board of Conduct may recommend suspension, but only the Vice President of Student Life & Dean of Students may impose it.

### **Expulsion**

Expulsion—a permanent involuntary separation of a student from Kettering University—may be recommended by a University Board of Conduct, but only the Vice President of Student Life & Dean of Students may impose it.

### **Notification of Sanction to Co-Op Employers**

The University has the right and responsibility to notify a student's co-op employer whenever the student is found to have violated the Kettering Code of Student Conduct.

### **Students' Use of Technology**

The use of any personal computational or communications devices in the classroom, not otherwise governed by University or course policies, is subject to the approval of the instructor. This includes, but is not limited to, the use of calculators, computers, personal digital assistants, text pagers, and cell phones. Any use of such devices without the instructor's approval is prohibited. The use of such devices without permission of the instructor may be considered disruptive behavior. Students who persist in such activity may be subject to the University's "Dismissal Due to Disruptive Behavior" policy.

The use of electronic devices to facilitate an act of academic misconduct, such as cheating or plagiarism, will be considered a violation of the Code of Student Conduct and adjudicated by Judicial Affairs.

Students are expected to familiarize themselves with Kettering University's Acceptable Use Policy, posted on the "Policies and Standards" section of the Information Technology website ([http://www.kettering.edu/it/policies\\_and\\_standards.jsp](http://www.kettering.edu/it/policies_and_standards.jsp)).

### **Dismissal from Class Due to Disruptive Behavior**

Whenever an enrolled student's presence or behavior in class disrupts the learning environment and, in the faculty member's opinion, undermines the best interests of the class and/or the student, the faculty member may request in writing (with a copy to the appropriate Department Head) that the student be issued an administrative dismissal. The faculty member should discuss the student's behavior with the Vice President of Student Life & Dean of Students (VPSL) and/or her designate, who will meet with the faculty member to discuss the alleged incident. The VPSL will also meet with the student to determine possible judicial action after determining whether or not the student's behavior violated the Kettering Code of Student Conduct. The VPSL will either appoint a judicial officer to adjudicate the matter or refer it for action by a University Board of Student Conduct. If the dismissal occurs by Friday of seventh week, student will receive a grade of W (withdrawal). If the dismissal occurs after Friday of seventh week, student will receive a non-passing grade.

### **Harassment and Discrimination Policies**

Kettering University expects all students, faculty, and staff to contribute to a productive learning environment by demonstrating behavior that neither interferes with another individual's performance nor creates an intimidating, offensive or hostile environment. The University will not tolerate harassment or discrimination in any forms, regardless of intent and/or the victim's reaction.

### **Harassment**

The University prohibits all sexual harassment and/or offensive conduct, on campus and in students' work section communities. Such conduct includes, but is not limited to, sexual flirtation, touching, verbal or physical advances or propositions; verbal abuse of a sexual nature; graphic or suggestive comments about an individual's dress or body; sexually degrading words to describe an individual; the display, in the workplace, of sexually suggestive objects or pictures, including nude photographs. Behavior constitutes sexual harassment when it is unwelcome and it interferes with the ability of another person to carry out his/her responsibilities, creates a hostile work environment; or its expression implies that acceptance of the behavior is a condition of course registration, course completion, course evaluation, or employment.

If you believe the words or actions of a University employee or student on campus constitutes unwelcome harassment, take the following steps:

- Inform him or her that his/her actions are unwelcome and the harassing behavior must cease.
- Keep a written record of the details (including time, date, what was said, or what was done).
- Report the discrimination to the Vice President of Student Life & Dean of Students, the Director of Human Resources, other University officials, or via our Non-Academic Grievance Form, available in the Student Life Office, Academic Services, the Wellness Center, Thompson Hall, and online at the Student Life website.

If harassment occurs at your work site, you should report it to your supervisor or the appropriate person as directed by your employee handbook, as well as to your Cooperative Education Manager/Educator. Enlist the counsel of a trusted advisor, if necessary, to report sexual harassment whenever it occurs. The University pledges that all complaints of harassment will be investigated promptly and will pursue a timely resolution, which the appropriate University officials will communicate to the parties involved. We will maintain confidentiality to the extent reasonably possible.

### **Discrimination**

Kettering University is committed to a policy of non-discrimination and equal opportunity for all persons regardless of race, color, gender, age, religion, national origin, height, weight, marital, military or disability status or any other basis protected by federal or state law. Discrimination includes, but is not limited to the following:

- Preventing any person from using University facilities or services because of that person's gender, race, color, national origin, disability, age, religion, veteran status, height, weight or marital status.
- Making determinations regarding a person's salary based on gender, race, color, national origin, disability, age, religion, veteran status, height, weight or marital status.
- Denying a person access to an educational program based on that person's gender, race, color, national origin, disability, age, religion, veteran status, height, weight or marital status.
- Instigating or allowing an environment that is unwelcoming or hostile based on a person's gender, race, color, national origin, disability, age, religion, veteran status, height, weight or marital status.
- Denying raises, benefits, promotions, leadership opportunities or performance evaluations on the basis of a person's gender, race, color, national origin, disability, age, religion, veteran status, height, weight or marital status.

If discrimination takes place at your work site, you should report it to your supervisor or the appropriate person as directed by your employee handbook, as well as to your co-op manager. Enlist the counsel of a trusted advisor, if necessary, to report discrimination whenever it occurs. The University pledges that all complaints of discrimination will be investigated promptly and will pursue a timely resolution, which the appropriate University officials will communicate to the parties involved. We will maintain confidentiality to the extent reasonably possible.

If you believe the words or actions of a University employee or student constitutes discrimination, take the following steps:

- Inform him or her that his/her actions are unwelcome and the discriminating behavior must cease.
- Keep a written record of the details (including time, date, what was said, or what was done).
- Report the discrimination to the Vice President of Student Life & Dean of Students, the Director of Human Resources, other University officials, or via our Non-Academic Grievance Form, available in the Student Life, Academic Services, the Wellness Center, Thompson Hall, and online at the Student Life website.

## **Health and Wellness Services**

### **On-Campus**

A licensed practical nurse is available during regular business hours. The nurse provides college specific nursing care and promotes health, wellness and preventive care for the student population. Care received in the Wellness Center is nurse-directed and based on physician approved clinical protocols.

All currently enrolled Kettering University students may utilize the center services. Services are free with the exception of a small charge for certain vaccinations and screening (TB screening, influenza). Students may drop in during business hours or call ahead to make an appointment. Services and programs include, but are not limited to:

- Treatment of minor ailments and injuries (such as scrapes, colds, flu, minor injuries)
- Advise on effective self-care and well-being
- Drug and alcohol counseling and resources
- Referrals to community healthcare providers
- Stress management
- Wellness workshops

Where appropriate, our LPN will refer students to a physician at McLaren Family Medicine Residency Center, located less than two miles from campus. Kettering University Campus Safety unit will provide transportation to students at no cost.

**Off-Campus: McLaren Family Medicine Residency Center - An Affiliate of Kettering University**

3230 Beecher Road, Suite #1  
Flint, MI 48532  
(810) 342-5656

**Business Hours:**

8:00 A.M. – 5:00 P.M., Monday, Wednesday, Friday

8:00 A.M. – 6:30 P.M., Tuesday, Thursday

**Acute Care Hours:**

12:30-1:15 P.M., Monday-Friday (Drop-in; first-come, first-served; time listed is the sign-in period each day - clinic will see all those signed-in that afternoon)

All students, whether referred by the Wellness Center or self-referred, may utilize the services of McLaren Family Medicine Residency Center physicians by making an appointment or dropping by the Acute Care clinic during the posted hours. McLaren will bill students' insurance companies and coordinate insurance benefits and referrals for treatment. Students must present their Kettering ID and health insurance cards at each visit. Students are responsible for co-payments and uncovered costs.

**Counseling Services**

The Wellness Center provides individual counseling to students who experience psychological, behavioral, or learning difficulties whenever they occur. Counselors are available by appointment. Students can drop by or call the Wellness Center to make an appointment. Some issues that a counselor can help with include, but are not limited to:

- Disability accommodations
- Relationship conflicts
- Stress and/or other emotional difficulties
- Grief and loss issues
- Alcohol or other drug use
- Transition to college life
- Harassing and bullying issues
- Workshops on a variety of topics

**24/7 Crisis Counseling**

Crisis counseling is available by phone at (800)273-TALK. Students in crisis (whether on campus, at a co-op assignment or elsewhere) should utilize the Suicide Prevention Hotline; available 24/7, 365 days a year.

**Disability Services**

Kettering University provides [disability services](#) in compliance with the American with Disabilities Act (1990) and its amendments, along with state and local regulations regarding students, employees, and applicants with disabilities. Under these laws, no qualified individual with a disability shall be denied access to participation in services, programs, and/or activities at Kettering University. In carrying out Kettering's policy regarding disabled students, employees and applicants, we recognize mobility, sensory, medical, psychological, and learning disabilities. We attempt to provide reasonable accommodations for these disabilities for all students who meet the criteria described in the Americans with Disabilities Act.

Any Kettering student who has been diagnosed with a physical, medical, psychological, or learning disability, or suspects that s/he may have one, must contact the Wellness Center. The staff will evaluate the required documentation in support of the claim of disability and make an assessment of a student's needs on a case-by-case basis. The Wellness Center will then make recommendations for the appropriate services and accommodations necessary to meet the legal requirements as required by law. The Center will inform faculty and staff who may be responsible for providing the services and/or accommodations. Each term, students must meet with each professor to arrange individual accommodations.

Prospective students in the admissions process should contact the [Wellness Center](#) as soon as possible to discuss appropriate documentation needed to verify a disability and to identify the type of services, accommodations, and adaptive equipment that may be necessary.

**Mandatory Health Insurance**

Kettering University requires all enrolled students to carry health insurance coverage. Students who have coverage through their parents or other means must provide proof of health insurance once a year through a third party, AIG Educational Markets, which



verifies coverage through their online system. Students who fail to provide proof of health insurance through the verification process will automatically be enrolled in AIG Student Health Insurance Plan, at a cost of \$1,260.00 for coverage from July 1, 2013 through June 30, 2014. No exceptions will be made. The 2013-14 verification period begins May 20, 2013 and concludes July 31, 2013. Students and parents may contact AIG Educational Markets at 888.722.1668 for further information.

### **Confidentiality**

We are not permitted by law to disclose any medical information to a parent or guardian without the consent of the student unless the student is mentally incapacitated or threatens to harm him/herself or someone else. When parents call us with a concern, we contact the student directly to request permission to speak with you. If you wish to share medical information with your parents, you must complete and submit to the Wellness Center a Release of Information, which may be downloaded at the Wellness Center website.

## **Campus Safety and Other Services**

### **Campus Safety**

Kettering University Campus Safety provides 24-hour safety and security services, 365 days a year, to promote a safe learning environment for students. Campus Safety officers provide the following services:

- Student assistance
- Crime prevention
- Complaints and crime investigations
- Emergency management
- General patrol of the Kettering campus
- Information and central communication center
- Security of buildings
- Safety and fire inspections
- Register student and employee vehicles
- Lost and found
- Identification of your valuables
- An escort service for a student or employee leaving a campus building alone at night
- A monthly summary of campus safety activity (published on the Campus Safety website)
- Enforce parking regulations

Kettering University contracts with the City of Flint Police Department to provide around the clock patrols of the campus and the surrounding neighborhood.

In the event of an emergency on campus, DIAL 911 from any campus telephone, or (810) 762-9501, and the Campus Safety Desk Officer will assist you, including calling emergency response personnel.

The Campus Safety office is located on the second (ground) floor of the Campus Center.

### **The Campus Bookstore**

The Campus Bookstore has become a "Virtual Bookstore." The Virtual Bookstore can be accessed at [www.kettering.bkstr.com](http://www.kettering.bkstr.com).

The Virtual Bookstore is operated by the Follett Higher Education Group for the University. We offer new, used, and digital textbooks, along with textbook rentals. The online store also offers Book Buyback and a wide variety of items, including school supplies, electronic technology, and a selection of Kettering attire.

The Virtual Bookstore accepts VISA, MasterCard, American Express and Discover credit cards, as well as checks and money orders.

### **The C-Store**

The on campus convenience store, generally referred to as the "C-Store," is located in the Campus Center (CC) in the Sunset Café, located in the southwest corner off the Great Court. We offer convenience foods, Starbucks coffee and lattes, along with everyday essentials, "Bulldog Wear" apparel, and accessories.

The C-Store is open 8:00 a.m. to 8:00 p.m. Monday through Friday and 11:00 a.m. to 8:00 p.m. Saturday and Sunday. We accept cash, checks, VISA, MasterCard, American Express and Discover credit cards.

### **Community Service/Student Civic Engagement Center**

The Student Civic Engagement Center (SCEC) is home to the community service, philanthropic, and voluntary organizations on campus, including Engineers Without Borders (EWB), Green Engineering Organization (GEO), realSERVICE, Relay for Life,

and Up 'Til Dawn. It also serves as the communications center for volunteer requests and community outreach opportunities for our students, as well as for coordinating CollegeTown service activities with UM-Flint, Baker College, and Mott Community College. Kettering students staff the center, under the direction of the Student Life office.

### **Food Services**

Sodexo, a provider of food services to colleges and universities throughout the country, operates several venues to serve the campus community, including dining rooms, beverage and snack vending machines, etc. All first-year students who reside in Thompson Hall are required to purchase a board plan during their residency. Current information including hours of operations may be found on the [Kettering Dining Services Website](#).

### **Greek Life**

Fraternities and sororities have played an important role in the collegiate experience at Kettering since the school's beginnings in the early 20<sup>th</sup> century. Currently, over 35% of our students belong to Greek organizations, which include 13 fraternities and 5 sororities. The Greek Life motto, "Civita, Scientia, Officium, Duces," translates to community, knowledge, service, leaders, and describes the four cornerstones of the Greek experience at Kettering University. These organizations offer many opportunities to meet new people, build life-long friendships, practice and hone leadership and management skills, and in many cases, to provide a home away from home through available housing. Members are expected to strive for academic excellence and to serve local and national communities by donating time and raising money for a variety of philanthropic causes.

#### **Fraternities:**

Alpha Phi Alpha  
Beta Theta Pi  
Delta Chi  
Delta Tau Delta  
Lambda Chi Alpha  
Kappa Alpha Psi  
Phi Delta Theta  
Phi Gamma Delta  
Pi Kappa Alpha  
Sigma Alpha Epsilon  
Sigma Chi  
Sigma Nu  
Theta Xi

#### **Sororities:**

Alpha Gamma Delta  
Alpha Kappa Alpha  
Alpha Phi  
Alpha Sigma Alpha  
Delta Sigma Theta

Kettering University endorses the College Fraternity Executives Association (CFEA) statement on hazing, which strictly prohibits its use and imposes severe sanctions on Greek letter organizations that engage in it. The CFEA hazing policy is contained in the "Statement of Relationship between Kettering University and Fraternities and Sororities," to which all Greek letter organizations must subscribe. All activities sponsored by our fraternities and sororities must be consistent with their founding principles, as well as with the educational mission of the university. They must also comply with federal and state laws, and Kettering University policies.

### **Kagle Leadership Initiatives (KLI)**

Through the Kagle Leadership Initiatives (KLI), Kettering students nurture academic excellence and promote urban leadership qualities and civic engagement among Flint area youth and their families to increase college attendance and graduation and foster life-long community involvement. KLI sponsors a variety of enrichment programs and activities, including mentoring, tutoring, coaching, and targeted special seminars such as taking the ACT/SAT, gaining admission to college, finding financial aid, and managing peer pressure and social acceptance. Students who are interested in making a difference in the Flint community are encouraged to apply for Mentor, Coach, or Tutor roles. Application dates vary throughout the year.

### **Library Services**

Kettering University has a library on campus. Refer to the Library Services section of this catalog for more information.

### **Multi-Cultural Student Initiatives (OMSI)**

The Office of Multi-Cultural Student Initiatives works to ensure students of color thrive and succeed at Kettering University. OMSI provides academic support services for students to facilitate their retention and graduation. It also creates and implements

special activities and events geared toward creating positive self-images and professional development skills. The office provides pre-college programs to increase the pool of students of color qualified to pursue degrees in science, technology, engineering, mathematics, and business.

OMSI provides these services for students of color:

- Academic Advising
- Academic Excellence Workshops
- Career Counseling
- Financial Counseling
- Mentoring
- Personal Counseling
- Pre-college Programs
- Recruitment
- Scholarships
- Tutoring

### **New Student Orientation: COMPASS and Camp COMPASS**

Our new student orientation program, COMPASS (Campus Orientation Meetings to Prepare Students for Academic and Social Success), provides new students with information and social opportunities that will facilitate a smooth transition to Kettering University. Carried out over four days immediately preceding the beginning of new students' first academic term, COMPASS presents students with a wide variety of opportunities for integration into the campus community, including meeting and getting to know faculty, staff, and students; learning where to obtain specific services and transact business, finding out where to get help, etc. All new students must complete COMPASS prior to attending classes for the first time.

Camp COMPASS, an off-campus leadership development program, is offered each Summer and Fall to new students and a select group of Kettering's student leaders. We encourage new students to take advantage of this unique program, designed to jump start their first year experience.

### **Parking**

Parking of all motor vehicles at Kettering University is by permit only. Parking for students, faculty and staff is allowed in designated permit lots only when vehicles are properly registered and display the appropriate parking identification. Parking permits may be obtained at the Campus Safety office located in the Campus Center. All campus visitors must register their vehicles with the Campus Safety office and obtain a Visitor's Permit. Parking regulations are posted throughout campus and on the [Campus Safety web site](#).

### **Parents' Advisory Council**

The Kettering University Parents' Advisory Council provides a channel of communication between parents and the University. It enables Kettering to address the special interests and concerns of parents and provides a means for the exchange of ideas and support.

### **Professional Societies**

Professional societies offer career development opportunities to students, as well as regional and national activities. Fourteen are represented on the Kettering campus:

- American Chemical Society
- Institute of Industrial Engineers
- American Institute of Aeronautics and Astronautics
- National Society of Black Engineers
- American Marketing Association
- Society of Automotive Engineers
- American Society of Heating, Refrigeration and Air-Conditioning Engineering
- American Society of Mechanical Engineers
- Society of Hispanic Professional Engineers
- American Society of Aeronautics and Astronautics
- Society of Manufacturing Engineers
- American Society of Mechanical Engineers
- Society of Physics
- Institute of Electrical and Electronics Engineers
- Society of Women Engineers

Each society has its own faculty advisor. Consult the Student Handbook for further information.

### **Recreation Services**

Recreation Services provides facilities and programs to meet the recreational and fitness interests of the Kettering community and their families. Opportunities exist to practice and learn skills which lead to healthy and satisfying life-styles. Numerous competitive and cooperative activities provide an ideal environment to test one's skills and to develop athletic competency.

The Recreation Center features an open multi-sports forum with wood and synthetic flooring. It includes five volleyball courts or four basketball courts or two tennis courts. This area is also used for indoor soccer, the semi-annual graduation ceremonies, and an annual Robotics competition. Other amenities include three racquetball/wallyball courts, one squash court, a 1/8 mile suspended jogging track, locker rooms, steam rooms, 25-yard six-lane pool, spa, group exercise room, Fitness Room with Magnum, Life Fitness, and other exercise equipment, Weight Room featuring Cybex equipment, equipment issue area, Student Lounge, Sargent Alumni Lounge, and staff offices.

Fitness programs including aerobics, water aerobics, yoga, body fat testing, indoor cycling, and walking programs. Clinics to familiarize students with Recreation Center equipment and fitness assessments are available for students. A number of instructional programs including scuba, Learn to Swim, Running for Fitness, and Karate are offered.

Reservations and drop-in play are accommodated. Memberships are available for individuals residing with students. A publication entitled "Recreation Center Guidelines" is published annually to aid members in use of the facility. A validated Kettering University ID card is required for access to the Recreation Center.

### **Special Campus Programs**

#### **Fine and Performing Arts**

Opportunities to participate in a variety of fine and performing arts are available to Kettering University students. Band, choir, watercolor painting, clay hand-modeling, photography and piano and guitar lessons have been offered dependent upon student interest.

#### **Flint Area Public Affairs Debates**

Kettering University co-sponsors the Flint Area Public Affairs Debates (FAPAD), a program devoted to promoting public understanding of critical political and social issues. Since its founding in 1986 by local educational institutions, a member of the Department of Liberal Studies has represented the university on the planning committee. The FAPAD provides four panel discussions or debates each year on such topics as strategies for improving Flint's business climate, the costs and benefits of increased homeland security, and the advantages and disadvantages of school vouchers. Debates take place at venues throughout Flint.

#### **Global Issues Film Festival**

The Global Issues Film Festival is presented annually to increase awareness of global issues among students and within the local community. Organized by the Department of Liberal Studies and jointly sponsored by Kettering University and Mott Community College, prize-winning documentaries from around the world are shown at both campuses. Every festival features discussions with filmmakers about the craft of filmmaking and the issues that stimulated the making of the films.

### **Student Life Programs**

The Student Life Programs office coordinates the development and implementation of programs and services that enrich student's collegiate experiences and facilitate personal growth.

#### **(Kettering) Student Government**

Kettering Student Government incorporates Student Senate, Operations Council, Academic Council, and Finance Council. Each year, the student body elects class representatives to the Student Senate, along with the Student Senate President, Vice President, and Administrator. This group's primary charge is to determine student needs, set guidelines and priorities for meeting these needs, and to ratify the President's appointment of a Director of Operations and a Treasurer.

The Student Senate oversees the general operation, approves planned programs and budget, and makes certain that actions of the Operations Council and Finance Council are consistent with the Student Government Constitution. The Student Senate also hears any appeals or grievances brought before it involving matters of constitutional interpretation.

Operations Council is responsible for planning, organizing, and conducting a comprehensive program of activities that meet the students' needs identified by the Student Senate. Areas of planned activities include such things as intramural athletic events, social events, special interest clubs, major events, production of the student newspaper, and management of WKUF radio station. The Director of Operations is responsible for appointing student chairpersons to the Operations Council.

Academic Council (AC) serves as the Student Government's primary channel of lobbying for student interest in academic matters. A few of the main objectives for AC are to create and evaluate proposals pertaining to University Policies and practices, investigate issues concerning academic quality for students of the University, and recommend the approval of resolutions and specific courses of actions concerning academic affairs.

Finance Council is responsible for maintaining up-to-date accounting records for each programming account, maintaining equipment inventories, formulation of the budget, and purchasing new equipment for students.

#### **Women's Resource Center/Office of Women Student Affairs**

The Clara Elizabeth Davidson Women's Resource Center serves as a focal point for all women on campus and provides both a place and a forum for programs that enhance their academic, professional, and personal development. Each term, the WRC presents weekly programs planned and carried out by students, as well as a number of special events designed to ensure women's full participation in the professions.

Kettering's Office of Women Student Affairs (OWSA) provides leadership concerning women's issues to ensure our students live and learn in a productive climate that encourages them to reach their full potential. The OWSA sponsors a wide variety of resources for current and potential women students so they have the knowledge and information necessary to pursue their interests.

## **Honor Societies**

**Alpha Pi Mu** is a national industrial engineering honor society. The eligibility of industrial engineering students is based upon superior scholarship and character of a fiduciary nature. Members of Alpha Pi Mu work responsibly to further the ideals and aims of the engineering profession.

**Eta Kappa Nu** is a national electrical and computer engineering honor society and has its Theta Epsilon Chapter at Kettering. Electrical engineering students who rank in the top quarter of their class are admitted after their junior year. Students ranking in the top third of their class are admitted after they become degree seniors.

**Gamma Sigma Alpha** is a national honor society that promotes intellectual interaction between Greek students and the academic community.

**Gamma Sigma Epsilon** is a national honor society recognizing scholarship in the field of chemistry has its Eta Beta Chapter at Kettering University. Its aim is to promote professionalism and scholarship in chemistry and the general welfare of its members.

**Kappa Mu Epsilon** was founded to promote the interest of mathematics among undergraduate students. This is fostered by activities such as outside speakers, films, student presentations, and participation in events such as National Mathematics Awareness Week.

**National Order of Omega** is a national honor society for fraternity members who have attained a high standard of leadership in inter-Greek activities.

**Phi Eta Sigma**, a national freshman honor society. To become a lifetime member, a student must qualify during one of the two freshman semesters. Normally about 5 percent of the class will achieve this scholastic honor.

**Pi Tau Sigma**, a national mechanical engineering honor society, selects members from the top-ranked junior and senior students on the basis of personality, leadership, and probable future success in mechanical engineering. The largest local chapter of this society is Kettering's Delta Chi Chapter.

**Professional Leadership Honor Society** Professional Leadership Honor Society, formerly Management Honor Society is an organization comprised of upperclassmen who have demonstrated leadership potential as evaluated by the management of their co-op employer. All members are appointed for one academic year. Activities consist of lunch and dinner meetings each year. Speakers are leading executives in industry and business. Members are given an opportunity to ask questions of these top executives and become acquainted with their ideas, backgrounds, and managerial philosophies.

**Rho Lambda** is a national honor society recognizing Panhellenic women with the highest qualities of leadership and service to their sorority.

**Robots** This honor society was organized in 1928 for the purpose of giving recognition to those students who have demonstrated outstanding leadership, citizenship, and service to the Kettering community. Scholastic standing is an added criterion for election.

**Sigma Alpha Chi** is a Kettering scholastic honor society founded in 1970 for the purpose of recognizing high scholarship among management students at Kettering.

**Sigma Pi Sigma** is a national honor society which exists to honor outstanding scholarship in physics. Membership is open to any student who has completed at least four courses in physics at Kettering, who ranks in the top third of their graduating class. Membership in the Society of Physics Students is also required.

**Tau Beta Pi** is a national engineering honor society and has its Michigan Zeta Chapter at Kettering. This association offers appropriate recognition to engineering students for scholarship and exemplary character.

**Upsilon Pi Epsilon** is an international computer science honor society and has its Michigan Epsilon chapter at Kettering. Its mission is to recognize academic excellence in computer science. Students qualify for membership as seniors by being in the top third of computer science majors in their graduating class.

## Clubs and Organizations

### Kettering University Clubs and Organizations Recognized by Kettering Student Government (KSG)

KSG recognizes a variety of campus clubs and organizations which operate under the Constitution of Kettering Student Government. Students may obtain further information regarding these groups, and procedures on how they can start their own, through the Student Life office.

**Aerospace Club:** To promote interest in careers in aerospace and aviation.

**Allies:** Provides resources and support for gay, lesbian, bisexual, and transgendered students.

**Airsoft Club:** To provide a structured environment for interested students to learn the fundamentals of the sport of Airsoft.

**Anime Club:** The promotion, viewing, and discussion of the Japanese style of animation.

**Aquaneers:** Scuba diving club.

**Asian American Association (AAA):** Supports and celebrates the various cultural heritages of Asian-descent students.

**Black Unity Congress (BUC):** Organizes activities to unify, stimulate discussion, and educate students about African-Americans and others.

**Chemistry Club:** Dedicated to advancing knowledge about chemistry.

**Chemical Engineering Club:** Offers support and resources to chemical engineering students.

**Chess Club:** Kettering students play, compete, and enjoy the game of chess.

**Christians in Action (A-Section):** Christian campus ministry.

**Cliffhangers/Rock Climbing:** Rock climbing at off-campus facilities.

**Dance Club:** Learn swing dancing, salsa, and other styles of dance.

**Fencing Club:** Provides training and competitive opportunities to students interested in fencing.

**Firebirds:** Automotive enthusiasts participate in competitive events, shows, instruction, tools, and facilities.

**FIRST Robotics:** Competitive robotic challenges.

**Gaming Society:** Members host matches and tournaments each semester playing Bridge, Euchre and other card games; role-playing games; board games such as Chess, Battletech, StarCraft, WarCraftII, and Magic; and others.

**Golf Club:** Members play golf.

**Green Engineers Organization:** Hosts eco-friendly activities and events.

**Grill Club:** Expands Kettering Student's knowledge of the art of grilling.

**Hockey Team:** Members play regional teams through the Michigan Collegiate Hockey Conference.

**International Club:** Members learn about history, world views, and diverse cultures.

**Jazz Band:** Musicians play jazz, rock, swing, and other styles of music.

**Karate Club:** Promotes the martial arts. Members who train regularly have the opportunity to join the World Tang Soo Do Association and to test for belts.

**Kettnetic Thunder Ultimate Frisbee Team:** Kettering's team competes in USA Ultimate college season and includes both A and B section members.

**Kettering Crusade for Christ (B-Section):** Christian campus ministry.

**KLUG:** Kettering Linux Users Group.

**Laser Tag:** Members play laser tag.

**Mudboggers/Off Road Club:** Sponsors trips to various off-road venues; promotes responsible four-wheeling.

**Open Source Club:** Furthers student knowledge of open source software.

**Outdoors Club:** Promotes outdoors activities, appreciation for nature, and sportsmanship through hiking, rock climbing, horseback riding, skiing, white-water rafting, and canoeing.

**Paintball Club:** Members play indoor and outdoor paintball.

**Physics Club:** To promote interest in Physics and related career fields.

**Pre-Med Club:** Open to all students who have an interest in medicine.

**Real Service:** Promotes and sponsors opportunities for volunteerism and community service.

**Soccer Club:** Members participate in scrimmages and sport club matches. The club also participates in city-wide leagues and tournaments.

**Student Newspaper:** Members produce the *Technician*, published monthly as the voice of Kettering students.

**Trap and Skeet Club:** Members, through training and educational sessions, learn how to shoot trap and skeet, sporting clays, .22 caliber rifles, and pistols. Hunting and firearm safety courses are also offered.

**Welding Club:** Instruction in welding technology.

**WKUF-FM:** Members operate a low-power radio station at 94.3 in Flint.

## Student Housing

### On Campus Student Housing

Frances Willson Thompson Hall provides an on-campus living and learning community for all students. Several living options are available, including co-ed, single gender, and 24-hour quiet, units. Thompson Hall's design affords maximum individual privacy, with each resident receiving their own room and unit groupings of 30-40 residents per unit. Resident Assistants staff individual units. RAs and professional staff carry out programs and activities which contribute to students' personal maturation. Residential Peer Tutors, upper class students with exemplary academic performance, provide tutoring, at no cost, in a variety of subjects.

All first year students, except those who are married or over 21 years of age, are required to live in Frances Willson Thompson Hall for a minimum of two academic terms. Transfer students who have completed one year of residence life elsewhere may request a waiver of the housing residency requirement. Waivers should be sent to the Director of Residence Life at least 30 days prior to enrollment.

The residence hall is air conditioned, heated, and networked for internet. Each student's room is equipped with a bed, desk, dresser(s), bookshelf, closet space, a Micro Fridge, telephone jack, a computer jack, and a cable television outlet.

### Off-Campus Student Housing

As a service to Kettering students, the University provides the opportunity for individuals, companies, and firms to publicize available off-campus housing through [Kettering's housing portal](#).

The University does not investigate, endorse, or guarantee the suitability of those who respond to the listings. Users of this service communicate and contract with each other individually and at their own risk. The University and employees of Kettering University are not liable for any actions occurring as a result of arrangements made between users of this service or for any errors or omissions made in compilation or printing of the listings.

## COOPERATIVE AND EXPERIENTIAL EDUCATION

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Cooperative and Experiential Education is the key experiential learning component of Kettering University's academic program. It is best exemplified as a three-way partnership agreement between a student, an employer, and the university. The purpose of the program is three-fold:

1. To provide students with progressively more responsible and productive experiences related to, and consistent with their academic program and professional goals.
2. To provide educational experiences which orientate and integrate students into productive and professional roles within their respective work environments or to prepare them for the next level of their educational pursuits.
3. To develop positive work-related habits, characteristics, and transferable skills which promote professionalism, leadership, ethical behavior, diversity and global awareness.

### Requirements

Cooperative and Experiential Education at Kettering University is based on an alternating full-time schedule. Students alternate 11 week academic terms with 12 week terms of progressively challenging work with an authorized employer. Students will also participate in professional development modules designed to integrate academic and work experiences at key points in their progression.

Students who complete their academic requirement in nine full-time terms or more must complete at least five satisfactory work terms at an authorized employer. Three of these five must occur after achieving Junior 1 status.

Students who complete their academic requirements in eight full-time terms (minimum of 16 earned credit hours per term) must complete at least four satisfactory work terms at an authorized employer. Two of these four must occur after achieving Junior 1 status.

Students transferring to Kettering University with 24 or more earned hours (sophomore status) must complete at least four satisfactory work terms at an authorized employer (three after attaining junior status). The work experience terms must be earned while a Kettering University student.

Students transferring to Kettering University with 56 or more earned hours (junior status), without a baccalaureate degree, must complete at least three satisfactory work terms at an authorized employer. The work experience terms must be earned while a Kettering University student.

Students transferring to Kettering University with a baccalaureate degree must complete at least three satisfactory work terms at an authorized employer. The work experience terms must be earned while a Kettering University student.

### Academics

Students placed with a co-op employer are expected to be in good academic standing. Many employers have specific grade requirements and it is the student's responsibility to know what those requirements are, as well as any resulting consequences of not meeting them. Students whose cumulative GPA falls below 2.7 may be in jeopardy of being released from their co-op assignment. It is the students' responsibility to submit their grades to their employer, if required. Students with poor academic performance may be required to complete consecutive academic terms successfully before being allowed to search for employment. Students should consult with their Cooperative Education Manager/Educator with questions about this process.

### The Alternation Sequence

Each student assumes responsibility for maintaining satisfactory progress toward their degree. This includes following an alternating sequence between school and work while they are enrolled (two school terms and two work terms per academic year). This alternation schedule is determined based on the student's section status (A or B section) noted below.

#### A-Section

Summer: School  
Fall: Work  
Winter: School  
Spring: Work

#### B-Section

Summer: Work  
Fall: School  
Winter: Work  
Spring: School



Any changes to this school/work sequence must be approved in advance through the petition process. Refer to the Academic Policies and Regulations section of this catalog (Petition to Alter Academic/Work Sequence) more for information.

## Continuous Growth

The cooperative education partnership is designed to achieve the educational and career goals of our students in conjunction with meeting the future human resource needs of the co-op employers. Because co-op is an academic program, Kettering students are encouraged to remain with the same employer throughout the entire program. Experience has shown that, in most cases, it is more advantageous for the student to progress within one organization than to change from one to another. Each time a student begins with a new organization, they start over in the learning process and are often given less responsibility until their learning curve increases. Staying with the same organization throughout the entire program has proven to increase opportunities and the responsibility level afforded to the student.

There are appropriate reasons for some students to request a new co-op employer or for an employer to terminate a student. This process is referred to as Reassignment. Students seeking reassignment must meet with their Cooperative Education Manager/Educator to help determine if the process is necessary. Kettering will approve reassignment after it has been determined that it would be in the best interest of the student and the employer (see below: Changing Co-op Employers). It should be recognized that changes in assignment are permitted, but are not granted solely on the basis of student financial gain, personal commitments or assumed responsibilities. The intent of the cooperative relationship is to meet the goals of both the student and the employer, but not at the expense of the other. A healthy respect for both is needed to maintain a successful program.

## Other Experiential Learning Opportunities

Kettering University offers an array of experiential learning opportunities that can be interchanged or used to greatly enhance the co-op experiences of our students. The best examples of these experiences include:

- On-campus co-op opportunities
- Internships
- Research opportunities
- Entrepreneurship opportunities
- Service Learning
- Competitions

Students who are interested in integrating some of these options should work closely with their Cooperative Education Manager/Educator; in conjunction with their degree departments.

## Selection by a Co-op Employer

Resumes of eligible students are forwarded to co-op employers by the Cooperative Education staff, or a variety of other means such as Co-op Employment Fairs, personal referrals, or through self selection via our Kettering Connect System, where employers may post their positions on line for students to review. Careful attention is given to student objectives, interests, needs and preferences. While most students obtain co-op employment through these efforts, students are equally encouraged to assist in the process by initiating contact with potential co-op employers through their own personal networks. The Kettering Cooperative Education staff will work with students who wish to pursue new co-op employers. All employers must be approved and entered into our database in order for students to receive credit for their work terms.

Co-op employers choose to interview an applicant based on the student's academic background, employment history, skills, extracurricular activities and honors. Factors that may influence selection by a co-op employer include communication skills, leadership potential, career interests, desire to work, and the capacity to acquire the necessary academic and practical experiences that lead to greater responsibility.

## Section Assignments

A-Section students begin school in July; B-Section students begin school in October. Kettering University assigns students into a section based upon space and class-load balance. The University will attempt to meet student requests, but has the right to determine section assignments. Co-op employers may also request section assignments for students based upon their co-op hiring needs.

## Registration

All students are automatically registered in their cooperative work experience term according to the alternation sequence. Students are allowed to register for a maximum of eight credits of coursework while registered for a co-op or thesis term.

## Grading System

To receive a Pass/Fail grade for a co-op work term, each student must have on file both the Supervisor and Student Evaluation of the co-op experience and evidence of completion of a Work-Term Reflection. The supervisor's evaluation of the student's co-op experience should be reviewed with the student and then signed by the employer. During a co-op work term, students generally work full-time (40 hours) a week, and in some cases, required to work overtime or various shifts depending on the employers needs. A student hired later than the start of the term, or released prior to the end of the term (except under extreme conditions) must work at least six weeks (250 hours) of the twelve week term and receive a "satisfactory" grade to have their work experience count toward graduation requirements.

## Professional Development Modules

Cooperative and experiential learning is fully integrated in our academic and educational program and supports University learning outcomes. Over the course of their academic career, students will participate in professional development modules designed to allow them to reflect upon, plan for, and be intentional in their personal work experiences.

## Work Experience Evaluations

The student's performance during a cooperative work experience term is evaluated by the student's supervisor, who is assigned for that term by the co-op employer. This evaluation is required by Kettering and is kept on file for five years after graduation or separation from the University. The terms are evaluated on a "satisfactory/unsatisfactory" grading format. No academic credit hours or quality points are earned through the work experience requirements of the program.

## Students Released From a Co-op Employer

Students released from an employer one or more times based upon performance may be required to complete a Skills Performance Assessment and could be required to work on campus as they acquire personal and professional development skills before returning to the work place. If a student is released due to grades, they may be required to take back-to-back school terms with a reduced number of credits to improve their academic standing.

## Changing Co-op Employers

It is mandatory that students work at least two work terms with an employer and have given their best to be a responsible employee before they petition for reassignment. Students desiring a change in co-op employer must meet with their Kettering University Cooperative Education Manager/Educator to discuss the reason(s) for the request. Requests for reassignment must be approved by the Cooperative Education Manager/Educator or Review Team. If it is determined that reassignment is the best option, prior notification to their current employer will be necessary before a new job search process is initiated. Students should not initiate a discussion with a prospective new employer without the knowledge and approval from the Cooperative and Experiential Education Office.

It should be emphasized that any deviation from this policy, or unilateral student action, to secure a new co-op employer without prior approval may result in that student jeopardizing receiving work experience credits for graduation and/or being placed on probation. It is imperative that we maintain good relationships with our employer partners, in addition to assisting students in successfully negotiating change.

The Cooperative and Experiential Education Office will assist students who are granted permission to seek new co-op employment. All students available for reassignment will be given access to the current co-op database, enabling their resume to be sent to co-op employers currently seeking students with similar profiles (academic major, skills, etc.).

## The Reassignment Process

The Reassignment Committee will consider all reassignment requests on a case-by-case basis. In order to submit requests for reassignment, students must follow these steps:

- Make an appointment with the Cooperative Education Manager/Educator before pursuing reassignment, preferably at the beginning of a term.
- The Cooperative Education Manager/Educator will work with the student to determine if reassignment is the right step.
- If pursuing reassignment is agreed upon, the student will fill out all necessary forms, which include:
  - Reassignment Employment Request/Authorization Form.
  - Reflection Form (for terminations).
  - Provide written documentation explaining reason(s) for the reassignment request.
  - Student Obligation Form (if necessary).
  - Employer Notification - This is a formal resignation letter (if necessary).
  - Ensure copies of the following are accurate and up-to-date:
    - All evaluations, both student and employer, are complete.
    - Current transcripts.
    - Updated resume.

The Cooperative Education Manager/Educator or Review Team will preview all submitted materials and make a decision. The Cooperative and Experiential Education Office is prepared to help guide and assist all students as they continue to grow with their organizations and move toward graduation. The student is encouraged to contact their Cooperative Education Manager/Educator for advice and counsel before making any change to their cooperative education program.

## **Transfer of Work Experience**

Students who have participated in other comparable college-level cooperative work experience programs or who believe they have significant work experiences related to their Kettering degree program may be eligible to transfer this work experience toward their Kettering degree requirements. Students wishing to pursue such action should contact the Cooperative and Experiential Education Office to determine the documentation necessary to transfer a maximum of two work experiences. These work experiences will apply toward the student's freshman and sophomore level experiences only.

## **Students without a Co-op Employer**

Students who are not employed by the start of their work term are allowed to continue in the academic program until they can no longer meet the minimum co-op requirements to graduate. Students seeking employment while attending classes must maintain a current resume, attend seminars on employment search skills, and apply for positions. They must be easily reached and available for interviews with prospective employers, and be proactive in the co-op search process with the assistance of the Cooperative Education staff.

Locating positions for students with unsatisfactory academic performance can be difficult. Students who continue to remain on academic probation and/or have been released for cause by their employer may forfeit their right to university assistance in finding new co-op employment. These students should immediately make an appointment with their Cooperative Education Manager/Educator.

## **Student Concerns and Complaints**

Refer to the Academic Policies and Regulations section of this catalog, under Student Complaint Procedures.

## CULMINATING UNDERGRADUATE EXPERIENCE (THESIS)

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All Kettering University baccalaureate programs require completion of the Culminating Undergraduate Experience (CUE), also known as the senior thesis, to graduate. The senior thesis is a professional document describing a comprehensive project performed by the student. The project is generally performed for the student's co-op employer (Co-op Thesis); however, with employer permission the student is eligible to perform another option for his/her CUE: Entre/Intra/Social E-ship Thesis, Research Thesis, or Professional Practice Thesis. Students become eligible to conduct work on the CUE when they have earned a minimum of 88 credit hours (Senior I Standing). The CUE project is an academic requirement approximately taking two terms to complete. Students are introduced to the CUE in a required seven week CUE 495 Introductory Course that will be launched in the Fall 2014 term. There are 4 credit hours awarded for the CUE and the student will earn a grade of Pass with Distinction, Pass or Fail upon the Faculty Thesis Advisor's approval of Kettering's standardized written thesis document. The focus of this project may be a product, system, creation of a comprehensive business plan or results of investigation of a new idea.

### CUE Options

A student is eligible to pursue one of four CUE options: Co-op Thesis, Research Thesis, Professional Practice Thesis and E-ship Thesis.

#### Co-op Thesis

This CUE option is carried out at the **student's co-op employment**. It is an individual project providing an opportunity for the senior student to apply his or her academic and co-op experience to a realistic problem. This option requires that a student be advised by a **faculty member** and **employer supervisor**. The student and employer advisor together develop the project. The topic selected is to be submitted to Kettering for approval, specifically the faculty member accepting the topic. The role of the employer advisor is to provide company resources, expertise to the student and reviews the preliminary thesis document. For further details, an employer advisor manual is available on the CUE website. The faculty advisor mentors the student, reviews the preliminary and final thesis documents, and issues a grade for the thesis upon completion. The student is required to produce a tangible artifact including a comprehensive final written report. This is a two-term project. In addition, participation in an annual Kettering Poster Session and/or presentation of the thesis is highly encouraged.

#### Research Thesis

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE) in collaboration with the research faculty member. This option requires that a student be advised by a faculty member as well as at least one qualified committee member. The topic is determined by a Kettering faculty member for accepted students pursuing this option and requires topic approval from the Research Thesis Proposal Review Committee. The student is required to produce a tangible artifact including a comprehensive final written report. This is a two-term project. In addition, participation in an annual Kettering Poster Session and/or presentation of the thesis is highly encouraged.

#### Professional Practice Thesis

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE). The project is focused on professional practice in a group setting and is interdisciplinary, providing an opportunity for the senior student to apply his or her academic and co-op experience to a realistic problem at a pre-selected organization. This option requires that a student be advised by a faculty member as well as at least one committee member (normally company liaison). The topic is pre-selected for accepted students pursuing this option and requires topic approval from the Professional Practice Thesis Proposal Review Committee. The student is required to produce a tangible artifact including a comprehensive final written report. This is a two-term project. In addition, participation in an annual Kettering Poster Session and/or presentation of the thesis is highly encouraged.

#### E-ship Thesis

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE). This option requires that a student be advised by a faculty member as well as at least one qualified committee member. The topic selected requires approval from the E-ship Thesis Proposal Review Committee. The student is required to produce a tangible artifact including a comprehensive final written report. This is a two-term project. In addition, participation in an annual Kettering Poster Session and/or presentation of the thesis is highly encouraged.

## Finding a CUE/Thesis Topic

### Co-op Thesis:

A topic idea for the project is submitted by the student with validation of approval from the Employer Thesis Advisor and review/approval by a Kettering University Faculty Thesis Advisor. Upon approval, the student may begin work on the project. The role of the Employer Advisor is to provide company resources, expertise to the student and reviews the preliminary thesis document. For further details, an Employer Thesis Advisor Manual is available on the CUE website. The Faculty Thesis Advisor mentors the student, reviews the preliminary and final thesis documents, and issues a grade for the thesis upon completion.

### Non Co-op Thesis:

It is the student's responsibility to find a topic for his/her thesis project. If the student is unable to secure a thesis project through his/her Co-op Employer, the student can then look into one of the following options:

#### E-ship Thesis:

This is a student generated idea whereby the fundamental basis of the thesis is a value proposition that goes beyond the design/build/technology of what may -- or may not be -- a new idea, gadget, solution or improvement ("a better mousetrap"). As such, the E-ship proposal contains criteria for consideration of the possible markets (customers), needs, approach, benefits, and competition. The student is required to submit the topic for approval and the proposal is available on CCUE's website at <http://www.kettering.edu/academics/academic-resources/academic-thesis-support-center/student>. Upon review and approval from the E-ship Thesis Proposal Review Committee, the student will be registered for the thesis project. Students are encouraged to find a Faculty Thesis Advisor to advise over the course of the thesis; however, one will be appointed if needed. For more information, please contact:

**Michelle Gebhardt**, CCUE Support Center Specialist, Center for Culminating Undergraduate Experiences  
3-301 AB, [810.762.9683](tel:810.762.9683) [mgebhard@kettering.edu](mailto:mgebhard@kettering.edu)

#### Research Thesis:

This is a project focused on conducting research most often on campus due to laboratory usage. It is an opportunity for the senior student to apply his/her academic and co-op experience to the investigation and experimentation of new ideas. The topic is provided by a Kettering faculty member. The Kettering faculty member is required to submit the topic for approval and the proposal is available on CCUE's website at <http://www.kettering.edu/academics/academic-resources/academic-thesis-support-center/student>. Upon review and approval from the Research Thesis Proposal Review Committee, the student will be registered for the thesis project. These projects are provided by the student's degree department. The projects are limited and students are selected based on their expertise matching the project scope. For more information contact your degree department head or appointed Thesis Administrator as indicated by major below:

**Biology:** Dr. Stacy Seeley, Department Head, 3-213 MC [810.762.9561](tel:810.762.9561) [sseeley@kettering.edu](mailto:sseeley@kettering.edu)

**Business:** Karen Cayo, Interim Department Head, 4-345 AB [810.762.7969](tel:810.762.7969) [kcayo@kettering.edu](mailto:kcayo@kettering.edu)

**Chemistry:** Dr. Stacy Seeley, Department Head, 3-213 MC [810.762.9561](tel:810.762.9561) [sseeley@kettering.edu](mailto:sseeley@kettering.edu)

**Chemical Engineering:** Dr. Steven Nartker, Assistant Professor, 2-230 AB [810.249.4041](tel:810.249.4041) [snartker@kettering.edu](mailto:snartker@kettering.edu)

**Computer Science:** Dr. John Geske, Department Head, 2-300I AB [810.762.7963](tel:810.762.7963) [jgeske@kettering.edu](mailto:jgeske@kettering.edu)

**Electrical/Computer Engineering:** Dr. James McDonald, Department Head, 2-703 E AB [810.762.9701](tel:810.762.9701) [mcdonald@kettering.edu](mailto:mcdonald@kettering.edu)

**Industrial Engineering:** Dr. Srinivas Chakravarthy, Interim Department Head, 1-700N AB [810.762.7906](tel:810.762.7906) [schakrav@kettering.edu](mailto:schakrav@kettering.edu)

**Math:** Dr. Leszek Gawarecki, Department Head, 2-100 A AB [810.762.9557](tel:810.762.9557) [lgawarec@kettering.edu](mailto:lgawarec@kettering.edu)

**Mechanical Engineering:** Dr. Paul Zang, Professor, 2-107 MC [810.762.7861](tel:810.762.7861) [pzang@kettering.edu](mailto:pzang@kettering.edu)

**Physics:** Dr. Kathryn Svinarich, Interim Department Head, 2-323J AB [810.762.7471](tel:810.762.7471) [ksvinari@kettering.edu](mailto:ksvinari@kettering.edu)

#### Professional Practice Thesis:

This is a project focused on professional practice in a group setting and is normally interdisciplinary. It is an opportunity for the senior student to apply his/her academic and co-op experience to a realistic problem. It is a pre-selected project at an external organization. These projects are determined by the Director of the Center for Culminating Undergraduate Experiences with consultation from members of the CCUE Advisory Board. Detailed

information is available on CCUE's website at <http://www.kettering.edu/academics/academic-resources/academic-thesis-support-center/student>. Projects are limited and students are selected based on their major and expertise matching the project scope. For more information contact:

**Dr. Matthew Sanders**, Director, Center for Culminating Undergraduate Experiences  
3-301 AB, [810.762.7946](tel:810.762.7946) [msanders@kettering.edu](mailto:msanders@kettering.edu)

**PLEASE NOTE:** Students, who have not found a thesis topic by the end of their Senior I Academic Term, are to contact Michelle Gebhardt at [mgebhardt@kettering.edu](mailto:mgebhardt@kettering.edu). **These students will be scheduled to meet with the CCUE Directed Thesis Committee and assigned a Directed Thesis project.**

#### **CUE Process**

Students will be educated on the entire CUE/Thesis during Module 1: CUE Introductory Course. Students will have two advisors upon topic approval through completion that will serve as mentors and review the comprehensive professional document. The thesis will be archived in the Thesis Digital Archive on Kettering's Library website for viewing. Both the student and employer will receive a bound copy of the thesis within two months upon completion. All confidential theses will not be bound nor will be available for viewing in the Digital Thesis Archive. Kettering's Confidential Agreement is available in KqUest for the student's employer to determine the sequestering period and for signature.

Students are **REQUIRED** to complete four modules for his/her CUE/Thesis which include:

- Module I: CUE Introductory Course - CUE 495 (Junior I or Junior II term)
- Module II: Submit a Proposal for Topic Approval (no later than Junior II term)
- Module III: Submit Progress Report (no later than Senior II term)
- Module IV: Submit Written Thesis (1<sup>st</sup> week of Expected Graduation Term)

#### **Registration**

While the CUE project is designed to be completed within two terms, there is only one registration. In most cases, the registration is placed in the academic term nearest to the approval of the student's thesis topic. Upon completion of the CUE project, when a final, passing grade is received in the Office of the Registrar and posted to the student's record, they will receive four credit hours for the project.

The CUE project will be considered "in progress" until a final grade is received in the Office of the Registrar and posted to the student's record, or until the expected term of graduation passes, whichever comes first. If the project is not completed by the expected term of graduation, a grade of "I" (Incomplete) will be issued by the Office of the Registrar and will remain for two terms. If the final grade is not received within those two terms, the "I" grade will convert to a grade of "F" (Fail). To extend the incomplete, the student must contact the Center for Culminating Undergraduate Experiences for advisement and approval.

For more information visit the Center for Culminating Undergraduate Experiences office at 3-301 AB, call ext. 9947 or visit the website.

**Dr. Matthew Sanders, Director**  
**Center for Culminating Undergraduate Experiences (CCUE)**  
**3-301 Academic Building, (810) 762-7946**

## STUDENT RECORDS

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The Office of the Registrar maintains the students' permanent academic record, including course registrations, enrollment status and the official transcript. The Registrar's Office is the point of contact for any required enrollment and degree certifications. As such, it is important that students keep the office current with their permanent mailing address so these services can be provided.

Note: The Registrar's office will not discuss the student record with any third party without a written consent from the student.

### Address, Phone, and Name Changes

Changes in addresses or phone numbers should be made by the student through [Banner Web](#). Changes in addresses and phone numbers can also be made in the Registrar's Office, Room 3-309 AB.

In order to process a name change, a copy of a government issued photo ID such as a driver's license and either a marriage license, a Social Security card, or a court order that reflects the new name are necessary. Name changes must be processed through the Registrar's Office.

### Permanent Academic Records

All information, applications, correspondence, etc., involved in admitting and processing the active progress of an admitted student are maintained for five years after the student has last been an active degree-seeking student. After five years only the student's attendance dates, academic performance, corporate affiliate and degree awarded are kept as a permanent record.

### Transcripts

A student's official academic record is maintained by the Registrar's Office at Kettering University and is normally reflected through a transcript. All [requests for transcripts](#) must be in writing. The Registrar's Office will accept this written permission in person, by fax 810-762-9836, scan/email, or by US mail. There is no charge for transcripts. Official transcripts will not be issued to students who fail to meet their financial obligations or agreements with Kettering University. Unofficial transcripts are also available on [Banner Web](#).

## THE FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

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The Family Educational Rights and Privacy Act (commonly referred to as “FERPA” or the “Buckley Amendment”), helps protect the privacy of student records. The Act provides for the right to inspect and review education records, the right to seek to amend those records and to limit disclosure of information from the records. The Act applies to all institutions that are the recipients of federal funding.

In accordance with FERPA, Kettering University has policies and procedures in place to protect the privacy of education records. Students will be notified of their FERPA rights annually by publication in the Undergraduate and Graduate Catalogs and by an annual email message to students at the beginning of the academic year.

### Disclosure of Education Records

Kettering University will disclose information from a student's education record only with the written consent of the student, except:

1. To school officials who have a legitimate educational interest in the records.  
**A school official is:**
  - A person employed by the university in an administrative, supervisory, academic, research, or support staff position (including Campus Safety and Wellness Center staff);
  - A person elected to the Board of Trustees;
  - A student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her task;
  - A volunteer or person employed by or under contract to the university to perform a special task, such as legal counsel or an auditor;
  - Agencies conducting business on behalf of Kettering University (i.e. National Student Clearinghouse, officials of the U.S. Department of Education and state and local educational authorities, accrediting organizations and banks).

### Educational Need to Know:

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 responsibilities for Kettering University.

2. To officials of another school, upon request, in which a student seeks or intends to enroll.
3. In connection with a student's request for or receipt of financial aid, as necessary to determine the eligibility, amount, or conditions of the financial aid, or to enforce the terms and conditions of the aid.
4. To organizations conducting certain studies for or on behalf of the university.
5. To comply with a judicial order or a lawfully issued subpoena.
6. To appropriate parties in a health or safety emergency.
7. When the request is for directory information (see below).

### Directory Information

Institutions may disclose information on a student without violating FERPA through what is known as "directory information." Kettering University designates the following categories of student information as public or "Directory Information." Such information may be disclosed by the institution at its discretion.

- Corporate affiliation
- Degrees awarded, including dates (actual and expected)
- Dates of attendance
- Degree program (major field of study, concentrations and minors)
- Degrees and honors awarded (including Dean's List)
- Enrollment Status (including full or part-time)
- Honor Societies
- Photo
- Previous institutions attended
- Class standing (freshman, sophomore, junior, senior, graduate student)
- Name, address and phone number
- E-mail address

### Solomon Amendment

Federal law requires that all institutions of higher learning provide directory information to the military upon request, including student name, address, telephone number, age or year of birth, academic major and level of education (e.g. freshman, sophomore, etc. or degree awarded). Where there is a conflict between the Family Educational Rights and Privacy Act of 1974 (FERPA), the Solomon Amendment would supersede FERPA.



## **Annual Notification to Students of Rights Under the Family Educational Rights and Privacy Act (FERPA)**

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

### **(1) Inspect and Review of Records**

The right to inspect and review the student's education records within 45 days after the day the University receives a request for access. A student should submit to the registrar, dean, head of the academic department, or other appropriate official, a written request that identifies the record(s) the student wishes to inspect. The University official 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 University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

### **(2) Amendment of Records**

The right to request the amendment of the student's education records that the student believes are inaccurate, misleading, or otherwise violate the student's privacy rights under FERPA. Students should write the University official responsible for the record, clearly identify the part of the record they want changed, and specify why it should be changed. If the University decides not to amend the record as requested, 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) Consent to Disclosure**

The right to provide written consent before the university discloses personally identifiable information from the student's education records, except to the extent that FERPA authorizes disclosure without consent.

The school discloses education records without a student's prior written consent under the FERPA exception for disclosure to school officials with legitimate educational interests. A school official is a person employed by Kettering University in an administrative, supervisory, academic, research, or support staff position (including Campus Safety and Wellness Center staff); a person serving on the board of trustees; a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her task; a volunteer or person employed by or under contract to the university to perform a special task, such as legal counsel or an auditor; agencies conducting business on behalf of Kettering University (i.e. National Student Clearinghouse, accrediting organizations and banks).

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 responsibilities for Kettering University.

### **(4) FERPA Complaints**

The right to file a complaint with the U.S. Department of Education concerning alleged failures by Kettering 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

For more information on the Family Educational Rights and Privacy Act, visit the Office of the Registrar Website, under [FERPA](#).

## ACADEMIC POLICIES AND REGULATIONS

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All faculty and students are urged to review and understand the University's Academic Policies and Regulations. This section is intended as a convenient reference for faculty, staff and students. It also serves as a description of the student's academic rights and responsibilities and as a guarantee of equitable treatment for all students. Some sections may reference other sections of the catalog, when necessary. Each section also concludes with the name of the official or office to contact with questions.

### Academic Advising

The primary purpose of the Kettering University academic advising program is to support the university's mission of preparing future leaders for a global workplace by assisting students in the development of meaningful educational plans. At Kettering, academic advising represents a shared relationship between the student and his/her academic advisor and a process of continuous improvement, clarification and evaluation with the aim of assisting the student in achieving his/her goals. Each academic department has established its own system for facilitating advising processes as well as a representative academic program. In addition to following the representative program, students are encouraged to meet regularly with an academic advisor (at least once per academic term) to discuss academic matters, to determine progress toward degree completion, and to ensure that prerequisites have been satisfied and other departmental requirements have been met.

Questions: Contact the degree/program department

### Academic Standing

Kettering University has four levels of academic standing: good standing, academic warning, academic probation, and academic review. The four levels are discussed in detail below.

#### Good Standing

To be in good academic standing, a student must maintain a term and cumulative GPA (grade point average) of at least 2.0.

#### Academic Warning

A student who fails to meet the criterion for good standing is placed on academic warning.

- If at the end of the warning term both GPAs (term and cumulative) are at least 2.0, the student returns to good standing.
- If at the end of the warning term either the term or the cumulative GPA falls below 2.0, the student is held on academic warning for one more term.
- If at the end of the warning term both GPAs (term and cumulative) are below 2.0, the student is placed on academic probation. A student who has been on warning for two terms and has not returned to good standing will also be placed on academic probation.

#### Academic Probation

A student is placed on academic probation after two consecutive terms in which he or she fails to earn both a term and cumulative GPA of at least 2.0.

- If at the end of the probation term both GPAs (term and cumulative) are at least 2.0, the student returns to good standing.
- If at the end of the probation term, either the term or the cumulative GPA falls below 2.0, the student is held on academic probation for one more term.
- If at the end of the probation term both GPAs (term and cumulative) are below 2.0, the student's case is reviewed by the Academic Review Committee (ARC) for potential dismissal. A student who has been held on probation for two terms and has not returned to good standing will also be reviewed by ARC.

A student on academic probation is required to develop and implement strategies for academic success with the assistance of a success coach. Appointments for success coaching may be arranged by visiting the Academic Success Center (3-322, Academic Building), emailing [academicsuccess@kettering.edu](mailto:academicsuccess@kettering.edu), or calling (810) 762-9775. Students on probation cannot register for consecutive academic terms.

#### Academic Review

Students on probation that fail to show significant academic improvement are referred to the Academic Review Committee, a subcommittee of the Kettering University's Faculty Senate. Students referred for academic review have two options - withdrawing from the university or appealing to the Academic Review Committee.

**Withdrawal**

Students who choose to withdraw must submit a completed [Undergraduate Withdrawal from University Form](#) to the Academic Success Center no later than the end of week five of the term.

**Appeal**

Students who choose to appeal to the Academic Review Committee, must submit an appeal letter along with any relevant supporting documents to the Academic Success Center no later than the end of week five of the term. Guidelines for submitting an appeal can be found on the ASC's website - <http://www.kettering.edu/academics/academic-resources/academic-success-center/advising/probation>. The decision of that committee is final, and no further appeal process is available.

**Readmission**

Whether the students withdraw or are dismissed from the university, they may be readmitted to Kettering under specific conditions. Students granted readmission will be admitted on a probation status and will be required to meet with an adviser to design an academic improvement plan (AIP). Students are expected to meet all the requirements of the AIP. Students cannot register for consecutive academic terms immediately following the readmission. If students lose good academic standing after readmission, they will proceed directly to the academic review process. Students are allowed only one readmission following an academic review.

**Readmission after withdrawal**

Students that decide to return to Kettering after a voluntary academic review withdrawal can do so after three consecutive terms (nine months) and with the signed approval of the Academic Success Center. Students requesting readmission after a withdrawal must submit a letter to the Academic Success Center no later than the end of week five of the term prior to being readmitted.

**Readmission after dismissal**

Students who are dismissed by the Academic Review Committee must petition for readmission directly to the committee no later than the end of week five of the term prior to being readmitted. All students can apply for readmission after a minimum of three terms (nine months) following the term of academic dismissal and only if all of the following conditions are met:

- During the period of dismissal the student attended another institution of higher education as a full-time, non-degree- seeking student, completing a minimum of twelve credit hours per term/semester.
- The student earned a 3.0 term/semester GPA from the college of attendance.
- Courses taken were representative of courses taken within the student's chosen degree program at Kettering University.

To request readmission after a dismissal, students must submit a letter along with the official transcript from the institution in which the courses were taken to the Academic Review Committee (c/o Academic Success Center).

Juniors and seniors can apply for provisional readmission after a minimum of two terms (six months) following the term of academic dismissal. To request provisional readmission, students must meet with an advisor in the Academic Success Center. In order for students to be fully readmitted, students must achieve a term GPA  $\geq 3.0$  during the provisional term with no individual course grade below a C. All withdrawals and incompletes during the provisional term must be pre-approved by the Academic Success Center.

**Academic Support**

The Academic Success Center provides a wide range of academic support to Kettering University students. Peer tutors assist students with subject knowledge in undergraduate math and science courses. Writing consultants help students with writing assignments in any classes. Professional advisors offer advising and coaching services. Appointments are preferred but not necessary. Tutoring schedules are available online ([www.kettering.edu/AcademicSuccessCenter](http://www.kettering.edu/AcademicSuccessCenter)) and in the Academic Success Center (3-322 AB). For more information, call (810) 762-9775.

**Academic and Work Terms**

Students alternate 11 week academic terms with 12 week terms of progressively challenging work with an authorized employer.

Questions: Contact the Office of the Registrar

## The Alternation Sequence – Academic and Work Terms

Each student assumes responsibility for maintaining satisfactory progress toward their degree. This includes following an alternating sequence between school and work while they are enrolled (two school terms and two work terms per academic year). This alternation schedule is determined based on the student's section status (A or B section) noted below.

### A-Section

Summer: School  
Fall: Work  
Winter: School  
Spring: Work

### B-Section

Summer: Work  
Fall: School  
Winter: Work  
Spring: School

Any changes to this school/work sequence must be approved in advance through the petition process (below).

### Petition to Alter Academic/Work Sequence

If circumstances arise and a student finds it necessary to alter their academic/work sequence, they must submit a [Petition to Alter Academic/Work Sequence Form](#). Exceptions are considered for circumstances involving GPA issues, problems in course scheduling, change in academic major, employment status, special academic opportunities (such as study abroad programs) or a documented, major medical concern. Students may not adjust their alternation sequence without receiving advisement and all required approvals on the petition form. This ensures the student, their academic advisor, the employer, the Cooperative Education Manager/Educator and the Office of the Registrar will be aware of any change in plans. As such, arrangements made between students and employers may or may not be approved. It is the responsibility of the student to submit the completed, signed Petition to the Office of the Registrar so that appropriate registration adjustments are made. Failure to comply with this procedure may put the student's status with the university in jeopardy and, in some cases, the student being dropped from the co-op program. Students should consult with the Financial Aid Office for information on how altering the academic/work sequence may affect financial aid.

Questions: Contact the Office of the Registrar

## Attendance

Prompt and regular attendance is expected of the student for all scheduled course and laboratory work. Student participation in class discussion, question/answer sessions and problem solving is critical to the expected student learning outcome. Faculty may include explicit attendance requirements with course grade penalties in their course. The student is expected to clearly understand, at the beginning of the term, if such requirements exist. Students should note that, although professors are not required to provide opportunity for making up missed work due to absence, most professors provide that opportunity when the absence was beyond the student's control. Only the professor may or may not excuse an absence.

### Dismissal for Violation of Professor's Attendance:

Faculty may have strict attendance policies whereby a student is dismissed from a class when a set number of absences are accumulated. If the dismissal occurs during the course withdrawal period specified on the academic calendar, a grade of W (withdrawn) is issued. If the dismissal occurs after the specified course withdrawal period, the grade of F (fail) is issued. The student may appeal the dismissal to the department head.

### Last Known Date of Attendance Reporting:

Kettering University does not require faculty to take attendance. However, the U.S. Department of Education requires the Financial Aid Office to differentiate students who fail a class because they quit attending from those who fail a class based on merit. Because a student could be a financial aid applicant at any point during the academic year, we must collect this information for all students, so that financial aid eligibility can be accurately determined.

The Last Known Date of Attendance Reporting Policy is necessary to appropriately assess the financial liability for students, ensure good stewardship of financial aid funds, and limit the financial liability for the university and academic consequences for the student. The amount of Title IV funds earned by a student is based on the amount of time spent in attendance by the student for that term. In addition, this is often useful in arbitrating cases when students believe they completed the process to drop or withdraw from a course.

After the drop/add period each term, a "last date of attendance" notification, or "never attended" notification by a faculty member will result in the automatic assignment of either a WN (withdrawal for non-attendance) grade or an FN (failure for non-attendance) grade by the Registrar's Office. This will initiate re-evaluation of a student's financial aid and Federal Title IV aid will be adjusted for those classes.

**Student Responsibility**

Students are expected to regularly attend classes in which they are enrolled. Students who decide to stop attending courses should immediately withdraw from those course(s) prior to the course withdrawal deadline specified on the academic calendar. Students who do not officially withdraw from a course (or courses) they are not attending may be reported by their instructor as having a last date of attendance. When this happens, the student will remain responsible for any financial liability, less applicable refunds they have incurred associated with the last date of attendance reported, and for any academic consequences associated with the last date of attendance reported and the assignment of the WN or FN grade.

**School Responsibility**

After the drop/add period each term, a last date of attendance reporting by a faculty member will result in the automatic assignment of either a grade of WN (withdrawal for non-attendance) or FN (failure for non-attendance) by the Registrar's Office as follows:

- A grade of WN (withdrawal for non-attendance) will be issued if the last known date of attendance is within the course withdrawal period specified on the academic calendar. A WN grade is treated the same as a W (withdrawal) grade in that it will not affect a student's term or overall GPA.
- A grade of FN (failure for non-attendance) will be issued if the last known date of attendance is after the course withdrawal period specified on the academic calendar. An FN grade is treated the same as a failing grade in that it will be included in a student's term and overall GPA.
- Once a faculty member has reported a last date of attendance, the student will no longer be able to attend or participate in the class.

With the Last Known Date of Attendance Reporting Policy, the assumption is that students who receive an F in a class have received that grade based on merit, and not because they quit attending.

Questions: Contact the Office of the Registrar

**Auditing a Course**

Occasionally, a student may wish to attend a course without earning credit (for example, to refresh course knowledge). This arrangement is called "auditing" a course. Audited courses are listed on the students' official transcript with the grade AU (audit) and no credits earned.

A student needs the course instructor's permission to audit a course. Students who want to audit a course must complete a [Request to Audit Course Form](#), have it signed by the course instructor, and submit it to the Office of the Registrar by the end of the drop/add period specified on the academic calendar. Audits cannot be changed to a regular enrollment after the drop/add period noted on the academic calendar. Audited courses do not count toward completing program or degree requirements.

Students who choose an audit option are expected to attend the audited class and complete all course requirements (with the exclusion of the tests). If the students do not meet attendance requirements for the course, they earn the grade of WN (withdrawn for non-attendance). Once a WN grade is issued, the student may no longer attend or participate in the class. AU and WN grades do not affect the term and cumulative grade point averages.

Audited courses incur regular tuition fees; however, audits are not considered part of a course load for academic or financial aid purposes, which means that students cannot count audited credits toward a full-time student status, or receive financial aid for an audited class.

Questions: Contact the Office of the Registrar

**Bachelor/Master Program**

These options are available only to Kettering University undergraduate students entering the MBA, Operations Management, Engineering or Engineering Management graduate programs.

Kettering University undergraduate students who desire to obtain a master's degree may elect to complete the Bachelor/Master Program which provides students an opportunity to accelerate the process in which they earn both a bachelor's degree and a master's degree. This program is only available to Kettering University undergraduate students and leverages Kettering University's premier academic programs. Students who are admitted into the Bachelor/Master Program will complete the same total number of work terms as conventional non-Bachelor/Master undergraduate students.

**Option 1: Undergraduate (BBA/BS) Thesis**

- Students must apply before graduating (after completing 120 credit hours) or within six (6) years after obtaining their undergraduate degree.
- The student completes the undergraduate degree, with the traditional undergraduate thesis (BS), and receives the bachelor's degree at the conventional time.
- Up to eight (8) credits of mezzanine level (500-level) courses, which were completed at the undergraduate level, are also applied to the master's degree. (Mechanical Engineering capstone courses do not apply.)
- Forty (40) credits remain to complete the MBA (total of 48 graduate credits) or thirty-two (32) credits remain to complete the master of science degree (total of 40 graduate credits). As an option, four (4) of these credits can be granted for an MS thesis.

**Option 2: Graduate Thesis Only: No Undergraduate Thesis**

- Students must apply before starting their undergraduate thesis (i.e., before submitting their PTA).
- Eight (8) credits granted for the graduate-level thesis, four are applied to the undergraduate degree and four are applied to the graduate degree.
- The student will not receive the bachelor's degree until completion of the graduate-level thesis.
- Up to eight (8) credits of mezzanine level (500-level) courses, which were completed at the undergraduate level, are also applied to the master's degree.
- One course (four credits) will be waived in the graduate program.
- Twenty-eight (28) credits remain to complete the master's degree (a total of 36 graduate credits).
- The MS thesis will be a more purely academic thesis driven by the faculty, but must be authorized by the student sponsor.

**Grade Requirements**

A minimum GPA of 3.5 is required. Students with a GPA below 3.5 may be considered on an individual basis. The degree-granting department will determine acceptance.

**Other Requirements**

- Both part-time and full-time MBA and MS students may qualify for this program.
- This program is only available to students who will receive (or have received) a Kettering University bachelor's degree.

In addition to the standard application, students must formally apply to the program. Contact Bonnie Switzer at 810-762-7953 or [bswitzer@kettering.edu](mailto:bswitzer@kettering.edu) for an Admission Application for the BBA/BS/MBA or BS/MS program.

**Questions:**

- For Mechanical Engineering options, please contact Dr. Raghu Echempati at 810-762-7835 or [rechempa@kettering.edu](mailto:rechempa@kettering.edu).
- For more information on this program for Industrial or Manufacturing Engineering, please contact the IME Department at 810-762-7941.
- For more information on this program for Business options, please contact the Department of Business at 810-762-7952 or [business@kettering.edu](mailto:business@kettering.edu).

**Classification**

Kettering University designates the classification of students, regardless of the degree program being pursued, according to the total earned hours accumulated.

Classification	Code	Earned Hours
Freshman	FRI	0-11
Freshman	FR II	12-23
Sophomore	SOI	24-39
Sophomore	SO II	40-55
Junior	JRI	56-71
Junior	JR II	72-87
Senior	SRI	88-103
Senior	SR II	104-119
Senior	SR III	120 and above

**Note:** The classification code, (FRI, FRII, SOI, SOII, JRI, JRII, SRI, SRII, and SRIII) whereby each major classification (Freshman, Sophomore, Junior, Senior) is subdivided into first and second semester levels, is for internal tracking of a student's progress and estimation of the expected graduation date.

Questions: Contact the Office of the Registrar

## **Concentrations**

A concentration is a specialized area of study within a major area of study. A concentration requires a minimum of two classes (eight credits) in a directed area of study. Concentrations appear on a student's transcript at student declaration, and requirements must be completed at the time of graduation. A concentration is not required for all majors for graduation.

A student wishing to declare a concentration should consult the head of the department that houses the major area of study, or a faculty advisor in that department. The department, in turn, will update the student record.

Questions: Contact the degree/program department

## **Cooperative and Experiential Education**

Refer to the Cooperative and Experiential Education section of this catalog for related policies and procedures.

Questions: Contact the Cooperative and Experiential Education department

## **Dean's List**

The Dean's List recognizes overall academic performance based upon the student's term grade point average (GPA). To be eligible for the Dean's List, students must satisfy the following requirements: be a degree-seeking student with a minimum term grade point average of 3.5, no grades below B, and a minimum of 16 earned credits for the term.

Questions: Contact the Office of the Registrar

## **Dual Majors/Degrees**

### **Double Major**

Students may earn a double major as part of a single bachelor's degree by completing all course requirements for the two majors. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue a double major, obtain approval from departments for both majors. Both majors will be shown on one diploma and on the transcript.

### **Two Degrees**

Students may earn two undergraduate degrees simultaneously by completing all course requirements for any two majors that in combination require at least 28 credits beyond 161 credits. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue two degrees, obtain approval from departments for both degrees. Two diplomas will be awarded and both degrees will be shown on the transcript.

Questions: Contact the degree/program departments

## **Dual Undergraduate/Graduate Student Status**

A Kettering undergraduate student may also hold Kettering graduate student status provided that (1) the student is currently accepted into a Kettering graduate program, and (2) all program requirements for the student's declared undergraduate major(s), except thesis, will be met during the current academic term. Under such dual status, a student may be permitted to take up to a combined total of 20 credits of undergraduate and graduate courses, including guest credits, during that term. Student must declare, in advance, how each course is to be used to meet specific program requirements.

Questions: Contact the Office of the Registrar



## E-mail: Notification/Obligation to Read

All students have the privilege of having a Kettering University Google Apps e-mail account. The Kettering e-mail account is one of the official ways Kettering University faculty and staff communicate to students. Students are responsible for required actions conveyed to them through this communication vehicle, whether or not they read the message. Kettering provides each student with 25GB of e-mail server storage. Therefore, we strongly recommend that students do not auto forward to another e-mail service provider which may have less storage capacity, fewer features, and may hinder you to reply directly to the original email source. Due to the proliferation of spam and phishing emails, be advised that you may receive emails that may request personal information such as usernames and passwords. Although it may look authentic, pretending to originate from a legitimate source such as Kettering, do not respond. Immediately delete it recognizing that a legitimate source such as the Kettering IT department would never ask you to provide information such as passwords. Be cautious regarding any unsolicited email as it may contain elements that would prove to be detrimental to your computer.

Questions: Contact Information Technology

## Enrollment Status/Verifications

Enrollment verifications for medical insurance, loan deferments, employment or other needs may be obtained through the Office of the Registrar. [Enrollment verifications](#) confirm a student's enrollment status (full-time, three-quarter time, half-time and less than half-time) and expected graduation date. Listed below are the enrollment statuses at Kettering University:

15 or more credits or COOP or Culminating Undergraduate Experience (thesis) = Full Time  
 12-14 credits = Three Quarter Time  
 8-11 credits = Half Time  
 1-7 credits or THS3 = Less Than Half Time

### Inactive Status Due to Non-enrollment

Students must have a registration in each term for course work, coop, or the culminating undergraduate experience (CUE) in order to remain a student in an active status. Circumstances may occur where this may not be possible. The student must then withdraw from the Kettering degree program until the next academic term in which they could be enrolled. Refer to the Academic Policies and Regulations section of this catalog for information on Withdrawals. Students with no registrations and who do not formally withdraw will automatically become inactive (separated) due to non-enrollment. Inactive students may apply for readmission by submitting an Application for Readmission Form to the Office of the Registrar, available in the Office of the Registrar or on their website. The student's cooperative employer is not obligated to continue their agreement with the student if the student status becomes inactive. However, the student and the employer are encouraged to make arrangements to re-establish that agreement when the student returns to active degree-seeking status whenever that is desirable and in their mutual interest. Students in an inactive status will no longer have access to any campus buildings, the Recreation Center or Banner Web. Inactive students are not eligible for participation in commencement.

Questions: Contact the Office of the Registrar

## Final Examinations

Kettering University policy requires each student to participate in a comprehensive final learning experience in each course. The extent to which that experience contributes to the student's course grade may vary by professor and by course, but generally amounts to between 20 and 40 percent.

Questions: Contact the Office of the Registrar



## Grades

Students may view and print their term grades on the Banner Web by using their Student Identification Number and Personal Identification Number (PIN). Unofficial transcripts are also available on Banner Web.

Grade	Description	Points
A	These grades are awarded to students whose level of performance in meeting the requirements of the course is outstanding. These students understand the concepts and the principles of the course and are able to apply them creatively to unfamiliar situations, to use correct methods accurately in problem solving, and to communicate their findings to others effectively.	4.0
A-		3.7
B+	These grades are awarded to students whose level of performance in meeting the requirements of the course is definitely better than average. These students have a good understanding of most or all of the concepts and principles, generally use correct methods, and are usually accurate in their thinking. They do a good, though not superior, job in communicating within the context of the course.	3.3
B		3.0
B-		2.7
C+	These grades are awarded to students whose level of performance is adequate. These students meet the essential requirements of the course and have a basic understanding of course concepts and principles, but have some difficulty applying them correctly. They do a fair job of communicating their ideas.	2.3
C		2.0
C-		1.7
D+	These grades are awarded to students whose level of performance in general is poor but not failing. These students meet minimum course requirements but lack adequate understanding of some concepts and principles and make rather frequent mistakes in applying them. They do a poor job of communicating ideas relating to the course.	1.3
D		1.0
F	This grade is issued to students whose level of performance fails to meet even the minimum requirements of the course. These students fail to grasp most of the essential concepts and principles and make frequent mistakes in applying them. Their performance is definitely unsatisfactory.	0.0
FN	A student is issued a grade of FN (failure for non-attendance) if they stopped attending and the last known date of attendance is after the course withdrawal period specified on the academic calendar.	0.0
AU	A student is issued the non-punitive grade of Audit (AU) upon submission of Request to Audit form during the course withdrawal period specified on the academic calendar.	0.0
I	A student is issued Incomplete (I) whenever the circumstances do not allow completion in the normal time period.	0.0
S	A Student is issued a grade of Satisfactory (S) upon receipt of a satisfactory employer/student evaluation.	0.0
U	A student is issued a grade of Unsatisfactory (U) upon receipt of an unsatisfactory employer/student evaluation.	0.0
W	A student is issued a non-punitive grade of (W) whenever withdrawing from a course during the course withdrawal period specified on the academic calendar.	0.0
WN	A student is issued a grade of WN (withdrawal for non-attendance) if they stopped attending and the last known date of attendance is during the course withdrawal period specified on the academic calendar.	0.0
P, PD, F, EX, NR	The thesis project is awarded the grade of Pass (P), Pass with Distinction (PD), Fail (F), Extension (EX), or Not Required (NR).	0.0

### Course Hours and Points Definitions

Quality Points = Grade x Credit Hours

GPA = Quality Points ÷ GPA Hours

**Attempted hours (AHRS)** - are the sum of the course credit hours for which a student has registered. Attempted hours per term is the basis for determining tuition charges and a measure of the student load.

**Credit hour** - represents one sixty-minute class period per week. For laboratory courses each credit hour represents two hours of scheduled laboratory work. A student is expected to devote three hours of effort per week for each registered credit hour. For example, a sixteen credit-hour load would require a total of forty-eight hours a week in classes, laboratories, study, and preparation.

**Earned hours (EHRS)** - represent work equivalent to that defined for a University credit hour which the student has successfully completed at Kettering University, at another institution or by examination. Not all earned hours necessarily apply to the specific degree program being pursued by the student.

**Grade Point Average (GPA)** - is computed for each term individually and cumulatively. In either case, the weighted GPA is computed by dividing the total quality points earned by the total quality hours accumulated.

**GPA hours (GPA-HRS)** - are equal to the credit hour value of the course and are awarded only for course work taken at Kettering University. Only course work resulting in GPA hours is used in computing a student's grade point average (GPA).

**Quality Points (QPTS)** - are a computational value used to compute a student's grade point average (GPA). The quality points earned for a given course are equal to the credit hour value of the course multiplied by the numerical equivalent of the letter grade.

Questions: Contact the Office of the Registrar

## Grade Appeals

The course instructor has the authority and obligation to assign appropriate grades in any course. Questions concerning an assigned final grade are to be handled through the grade appeal process. The first level of academic appeal is the professor whose decision is questioned. The first step in this process involves contacting the course instructor in writing.

The process is initiated by completing a [Grade Appeal Form](#). Each student must complete the grade appeal form and attach any pertinent documentation to support his/her claim. Appeals should be initiated as soon as possible but no later than four (4) months after the grade has been posted. The student's failure to access grades does not provide an exemption from the time limitation. The faculty member should respond within two (2) weeks of the student's request for grade modification.

Students who are not satisfied with the decision of the Professor to whom they appealed, may subsequently appeal to the instructor's department head within 30 days of the faculty member's response. The Department Head must respond in writing to the student with a copy to the Instructor within 30 days of receipt of the appeal. The Department Head will serve as a mediator between the student and the instructor but cannot change a grade.

Students may submit a final appeal to the Associate Provost and Associate Vice President for Academic Affairs for appeal board review under the following conditions:

- Final course grades may be appealed only if the student can demonstrate that the grading policy applied to his/her grade does not conform with the stated grading policy of the professor. The absence of a grading policy will be considered reasonable grounds for appeal.
- The only legitimate grounds for second level appeal are arbitrariness, prejudice, or error, as applied to a specific student.
- Final appeals are restricted to cases in which the department head disagrees with the instructor's decision.

When a final appeal is initiated, the Associate Vice President for Academic Affairs will convene an appeal board comprised of the following members: one tenured faculty member from the instructor's department, chosen by the instructor; one tenured faculty member from the instructor's department, chosen by the department head; one tenured faculty member from outside the instructor's department, chosen by the Chair of ADEPT and the Associate Vice President for Academic Affairs (or designee), who does not vote, but chairs the board and handles all administrative matters. If the Appeal Board chooses to override the faculty member's grade, they can only do so by changing the grade to a "P" for passing. The Provost's Office will provide a written overview of the Appeal Board's decision to all involved parties. Appeal Board actions represent a final university decision.

Students who are dismissed or suspended for reasons other than academic should refer to the Student Handbook for appeal procedures.

Questions: Contact the Office of the Registrar

## Grade Changes

Grades (except incompletes) reported by an instructor are considered permanent and final. However, requests for a change of grade after an instructor reports a final grade will be honored to correct an error in calculating or assigning that grade. To facilitate this process, the instructor will submit to the Registrar a grade change form noting the rationale for the change and what retroactive correction is to be made. This form must be countersigned by the instructor's department head. Grade changes must be processed within one calendar year (12 months) from the last date of the term in which the course was taken. This includes incomplete grades that have been changed to a grade or have converted to a failing grade. Grade changes are not permitted after a degree has been awarded.

Questions: Contact the Office of the Registrar

## Graduation

Detailed [graduation information](#) is available on the Office of the Registrar website. This information includes important deadlines and eligibility requirements. Students should review this information carefully to ensure successful completion of the graduation process.

Kettering University awards degrees at the conclusion of each term; summer, fall, winter and spring.

### Graduation Requirements

In order for an undergraduate degree to be awarded and verified by the Office of the Registrar, the following requirements must be satisfied:

**Academic Course Requirements:** Meet all specified course work, design credits, earned hours, and project requirements of the degree.

#### Cooperative Education Requirements:

- Students who complete their academic requirement in nine full-time terms or more must attain at least five satisfactory work evaluations at an authorized employer. Three of these five must occur after achieving Junior 1 status.
- Students who complete their academic requirements in eight full-time terms (minimum of 16 earned credit hours per term) must attain at least four satisfactory work evaluations at an authorized employer. Two of these four must occur after achieving Junior 1 status.
- Students transferring to Kettering University with 24 or more earned hours (sophomore status) must achieve at least four satisfactory work terms at an authorized employer (three after attaining junior status). The work experience terms must be earned while a Kettering University student.
- Students transferring to Kettering University with 56 or more earned hours (junior status), without a baccalaureate degree, must achieve at least three satisfactory work terms at an authorized employer. The work experience terms must be earned while a Kettering University student.
- Students transferring to Kettering University with a baccalaureate degree must achieve three satisfactory work terms at an authorized employer. The work experience terms must be earned while a Kettering University student.

**CUE (Culminating Undergraduate Experience) Requirement:** Satisfactorily complete a CUE project.

**Academic Performance Requirements:** Be in academic Good Standing and achieve a cumulative GPA of at least 2.0.

**Residency Requirements:** Complete a minimum of five full-time academic terms on the Kettering University Campus.

### Financial Obligations

Diplomas and transcripts are withheld until the student has satisfied all financial obligations with the University.

### Accelerated Pace to Graduate

It is possible to complete the academic portion of most Kettering degree programs in eight academic terms. Students who are interested in pursuing this possibility should contact their academic department to obtain an individualized accelerated plan and to determine if it is appropriate for them.

### Final Degree Verification Letter

A final letter is sent to the student and his/her co-op employer when all requirements for graduation are met. Final letters will not be issued until all grades for the graduating term are submitted and posted to the student's record.

## Graduation Honors

### Academic Honors

**Summa Cum Laude:** Highest distinction based on a cumulative weighted grade average of 3.90 or higher.

**Magna Cum Laude:** High distinction based on a cumulative weighted grade average of 3.70 or higher.

**Cum Laude:** Distinction based on a cumulative weighted grade average of 3.50 or higher.

Questions: Contact the Office of the Registrar

## Institutional Honors

**Leadership Fellow:** A student leadership endowment established by recent graduates recognizing aspiring student leaders.

Questions: Contact the Office of Student Life

**Outstanding Thesis Award:** Recognizes exceptional performance in Kettering's Senior Thesis Project. Candidates for this award must have received a grade of "Pass with Distinction" on their theses and be nominated by their faculty advisors.

Questions: Contact the Center for Culminating Undergraduate Experiences (CCUE)

**President's Medal:** The President's Medal is a recognition given to graduating seniors who excel in scholarship, in professionalism on the job, in their academic pursuits, in involvement in the Kettering community, and in their home community. Students are nominated by employers, faculty, and staff and are selected by a committee appointed by the President of the University. The number of medals given is at the discretion of the President but generally will not exceed two percent of the graduating class.

Questions: Contact the Office of Student Life

**Sobey Scholars:** This award is made annually in memory of Albert Sobey, the founder and first president of GMI/Kettering University. The following students are recipients of the Albert Sobey Memorial Award:

- Biochemistry students who are elected to membership in both Gamma Sigma Epsilon and Robots
- Bioinformatics students who are elected to membership in both Upsilon Pi Epsilon and Robots
- Biology students who are elected to membership in both Beta Beta Beta and Robots
- Business students who are elected to membership in both Sigma Alpha Chi and Robots
- Chemistry students who are elected to membership in both Gamma Sigma Epsilon and Robots
- Computer Science students who are elected to membership in both Upsilon Pi Epsilon and Robots
- Engineering students who are elected to membership in both Tau Beta Pi and Robots.
- Mathematics students who are elected to membership in both Kappa Mu Epsilon and Robots
- Physics students who are elected to membership in both Sigma Pi Sigma and Robots
- Students who earn cum laude status (as of the last completed grade period) and are elected to membership in Robots

Questions: Contact the Office of Student Life

## Incomplete Grades

The grade of "I" (Incomplete) may be issued by an instructor for any course in which the instructor deems that the work has not been completed and that it would be fair and equitable to allow the student additional time to complete the work. The conditions and terms for completion of the course are mutually agreed upon by the instructor and the student. The deadline for completion is at the discretion of the instructor but is not to exceed six months from the last day of the term in which the course was registered. If a final grade is not submitted within six months, the incomplete grade converts to an "F" (Fail) on the student's record and will be reflected in the students' GPA. The grade of "F" will be considered a permanent grade.

The incomplete grade may be extended by the instructor for up to an additional six months, or one calendar year from the end of the term in which the course was registered. To initiate an extension, the instructor will notify the Office of the Registrar in writing. The instructor is under no obligation to grant an extension. If a final grade is not submitted within the six month extension period, the incomplete grade converts to an "F" (Fail) on the student's record and will be reflected in the students' GPA. The grade of "F" will be considered a permanent grade.

A written agreement must be developed between the instructor and the student to clarify a plan for completion of the course. The student initiates this agreement by completing an Incomplete Grade Agreement Form after the incomplete grade has been issued by the instructor. The form will be filed in the Office of the Registrar as official documentation of the agreement.

Students should note that an incomplete grade does not yet reflect credit in the course. This means if a course with an incomplete grade is a prerequisite for another course, they may not register for the other course until the incomplete grade has been changed to reflect a passing grade. Prerequisite overrides are granted at the discretion of the department head for the course.

Questions: Contact the Office of the Registrar

## Independent/Directed Study

In order to increase the scope and flexibility of course offerings, many departments offer courses under the designation of Independent or Directed Study. A student who desires a course not normally offered or not available during a given term should approach the instructor in whose discipline the course would normally fall to discuss the possibility of an Independent or Directed Study. If the instructor agrees, a written proposal may be required from the student, specifying the reading and/or research to be undertaken, reports or tests to be used for grading purposes, number of meetings per week, number of credits to be awarded, etc.

### Independent Study

An independent study is a unique topic in a specific area of study not offered in an existing course. Requirements and meeting times are arranged by the instructor and student. A student must request and receive approval for an independent study through the instructional department. This is done by completing an [Independent/Directed Study Form](#) stating the independent study name and description, and obtaining all required signatures. The completed form must be submitted to the Office of the Registrar no later than the last day of the drop/add period specified on the published academic calendar.

### Directed Study

A directed study is a course listed in the undergraduate catalog but not scheduled during a given term. It is done on a one-on-one basis with an instructor for that course. A student must request and receive approval for a directed study through the instructional department. This is done by completing an [Independent/Directed Study Form](#) stating the course number and obtaining all required signatures. The completed form must be submitted to the Office of the Registrar no later than the last day of the drop/add period specified on the published academic calendar.

Questions: Contact the department offering the course

## Leave of Absence

The Undergraduate Student Leave of Absence (LOA) Policy assists and encourages students to return and complete their degree after up to two consecutive terms of absence from Kettering University. Eligible students are encouraged to take advantage of the benefits provided by an LOA, e.g., no need to apply for readmission and may participate in their regularly scheduled registration/enrollment period upon return to the University. Refer to the [Leave of Absence Request Form](#) for more information and instructions.

Questions: Contact the Office of the Registrar

## Majors (Declaring/Changing)

A major is an area of concentrated study which requires a minimum of 41 classes (161 credits). A student wishing to declare, change or add a major should consult the head of the department housing the major, or a faculty advisor within that department. The student is then responsible for completing a [Declare/Change of Degree Request Form](#) and obtaining all required signatures. This form must then be submitted to the Office of the Registrar for processing. The Registrar, in turn, will update the student record and send official notification of the change to the appropriate departments.

Questions: Contact the Office of the Registrar

## Minors (Declaring/Removing)

A minor is an area of concentrated study outside of the major area of study. A minor requires a minimum of four classes (16 credits) in a directed area of study. Minors may require coursework beyond the minimum 161 credits required for completion of the major. Coursework taken outside of Kettering University is not transferable towards a minor. Minors are not required for graduation though a student may elect to pursue a minor in an area of additional interest. Minors appear on a student's transcript at student declaration, and requirements must be completed at the time of graduation. The Academic Department granting the minor provides an audit for each student who applies to graduate. Refer to the "Minors" section of this catalog for a complete list of minors and their requirements.

A student wishing to declare a minor should consult the head of the department that houses the minor, or a faculty advisor in that department. The student is then responsible for completing a [Minor Declare/Change Request Form](#) (this form is necessary to declare or remove a minor). This form must then be submitted to the Office of the Registrar for processing. The Registrar, in turn, will update the student record.

Questions: Contact the Office of the Registrar

## Proficiency Credit by Examination

Students may petition the Department Head responsible for a given course to receive earned hours by examination for that course. If the department head deems it appropriate and acceptable, the student will be given the means to demonstrate knowledge and performance of the course material at a level no less than an average student enrolled in the course. If such demonstration is successful, the course credit hours will be awarded to the student as earned hours by examination and will be indicated on the student's transcript. A student who previously attempted a course or is currently enrolled in a course may not use the proficiency credit by examination option for that course. Students may attempt to earn credit by proficiency in a specific course only once, regardless of whether the examination is passed or failed.

Questions: Contact the degree/program department head for the course

## Readmission to Kettering University

Students who were academically eligible to continue when they became inactive or withdrew may return to active status by completing an [Application for Readmission](#). The Registrar will inform the student of the registration steps and assist in obtaining the necessary classes. The student will also need to be in good financial standing to be reinstated. Students are allowed to reactivate their active student status without having an official cooperative employer for one term only. Permission to continue after that one term is determined on a case-by-case basis and is for one additional term at a time.

Questions: Contact the Office of the Registrar

## Registration

### New Students

All first-time freshmen are given exams in mathematics unless college transfer credit or Advanced Placement credit is awarded for calculus. Based on exam results and intended degree program, each student will be registered for first term courses and will receive their schedules during orientation weekend.

First-term transfer students are scheduled based upon the individual's choice of major and the amount of transferable course work awarded. The student will be given an opportunity to review transfer credits and term class schedule during the transfer student orientation held prior to the start of classes.

### Continuing Students

[Registration](#) takes place each term during eighth, ninth, tenth and eleventh weeks. Students register for the next academic term; i.e., register in spring term for fall classes, register in summer term for winter classes, etc. Financial clearance from the Student Accounts Office and a completed course selection form, if required, signed by both student and faculty advisor are required to participate in registration. Future schedules will be administratively adjusted if prerequisite courses are not satisfactorily completed.

Students may receive academic advising and course selection approval by making an appointment with their faculty advisor. Seniors, juniors, sophomores and freshmen with a declared major receive advisement in their degree department. Students who have not declared a major receive advisement in the Academic Success Center.

A student's registration time period is based upon their current class standing and does not count current registrations or class rank. Each class standing will have a 24 hour window of opportunity to register for classes before the next standing will be allowed to register.

### Course Registration with Co-op or Thesis

All students are automatically registered in their cooperative work experience and thesis terms. Students are allowed to register for a maximum of eight credits of coursework while registered for a co-op or thesis term. Complete the [Course Selection During Co-op Term Form](#) to initiate the process.

### Course Loads

The representative program of courses shown term-by-term for each of the degrees offered indicate what is considered a normal course load. In general, those loads are four courses per term for underclassmen amounting to approximately 16 attempted hours, and five per term for upperclassmen, amounting to 20 attempted hours. Refer to the Tuition and Fees section of this catalog for tuition rates/credit hours.

**Drop/Add**

Students may drop and add courses during the late registration and drop/add period noted on the published academic calendar. Any student who does not appear on the final roster by the conclusion of the late registration and drop/add period will not receive credit for the course.

**Late Registration**

Students may “late register” (after the registration period) by contacting the Office of the Registrar. The deadline to late register is by the end of the late registration and drop/add period noted on the published academic calendar. Any student who does not appear on the final roster by the conclusion of the late registration and drop/add period will not receive credit for the course.

**Overloads**

Students are eligible to register for one additional course beyond the limits if:

- Their cumulative GPA is 3.5 or higher, and
- They have completed a minimum of 16 credit hours with no course withdrawals or failures in both the current term and previous academic term, and
- They are not currently enrolled in college mathematics.

Students wishing to take overloads beyond the standards above will need to obtain approval from the Registrar by completing a [Request for Overload Form](#). Only students in good academic standing are allowed to attempt an overload. Students whose performance is less-than-good standing may be required to take a course load less than that represented for their degree program. These students should contact Academic Services (Room 3-322 AB) with questions and for advisement.

**Undergraduates Taking Graduate Courses**

Students taking 500 or above level courses are not automatically admissible to the graduate program. They still have to meet all published admissions requirements. NOTE: Courses taken for undergraduate credit at Kettering University may not be repeated at the graduate level and count towards the graduate program. Furthermore, 500-level courses taken at Kettering University for undergraduate credit may not count as graduate credit except as approved per the BS/MS and BS/MBA policy guidelines.

**Undergraduates Taking Graduate Courses for Undergraduate Credit**

Students enrolled in an undergraduate degree program at Kettering University may request registration in a Kettering graduate level course (above 500-level) for undergraduate credit. To do this, students must:

- Complete and receive instructional department and degree department approvals on the [Undergraduate Request to take Graduate Course Form](#) AND submit form to Registrar’s Office for proper registration.

**Undergraduates Taking Graduate Courses for Graduate Credit**

Students enrolled in an undergraduate program at Kettering University may request registration in a Kettering graduate level course (500 or above level) for graduate credit. Undergraduate students may take up to three graduate courses for graduate credit while an undergraduate student (no more than two per term).

Students are eligible if:

- They are enrolled in an undergraduate program at Kettering University, and
- They are in good academic standing, and
- They have a minimum of 120 earned credits, and
- They are carrying no more than 20 credits, unless qualified to take 24 credits.

In order to receive graduate level credit, students:

- Must complete and receive instructional department and degree department approvals on the [Undergraduate Request to take Graduate Course Form](#) AND submit the form to Registrar’s Office for proper registration.
- May be enrolled as a guest student.

Questions: Contact the Office of the Registrar

**Repeating a Course****Repeating a Course**

Students may repeat any course taken at Kettering University as long as it is still offered. The following conditions apply:

- There is a limit of one repeat per course (for a total of two attempts). Withdrawals and audits are included in the number of repeat attempts.
- Both grades will appear on the student record and transcript.
- The higher grade received is used in computing the term and cumulative GPA values; the lower grade will be excluded from the term and cumulative GPA values.

- The recalculation of GPAs to account for repeated courses occurs at the end of the term after all grades for all students have been processed.
- Courses repeated at another institution and transferred to Kettering will not replace any attempts at Kettering.
- Hours earned in repeated courses may be counted toward graduation only once.
- Once a degree has been awarded, students cannot repeat a course and have the new grade count towards that degree.

Additional repeats (beyond one) require the approval of the Academic Success Center, which will be provided only if the student commits to an Academic Improvement Plan. The following conditions apply:

- All grades will appear on the student record and transcript.
- Only one grade (the lowest grade) will be excluded from the term and cumulative GPA values. All other grades will be included in the term and cumulative GPA values.
- The recalculation of GPAs to account for repeated courses occurs at the end of the term after all grades for all students have been processed.
- Courses repeated at another institution and transferred to Kettering will not replace any attempts at Kettering.
- Hours earned in repeated courses may be counted toward graduation only once.
- Once a degree has been awarded, students cannot repeat a course and have the new grade count towards that degree.

Questions: Contact the Office of the Registrar

## Second Baccalaureate

Students can earn a second bachelor's degree after graduating. The policy regarding requirements for Two Degrees applies. The department offering the major sought for the second bachelor's degree must evaluate the student's transcript to determine which additional courses are required and any additional work term and CUE requirements will be required.

Questions: Contact the degree/program department head

## Student Complaint Procedures

A complaint is a written or verbal expression of dissatisfaction or formal allegation against the university, its units, its employees (including faculty and staff), and/or its students.

### Harassment and Discrimination

For complaints related to harassment or discrimination in the learning or work environment, refer to the Student Life section of this catalog, under Student Conduct: Behavioral Standards.

### Other Complaints

Currently enrolled students who have a complaint or issue should first try to work out the problem informally by discussing it in an honest and constructive manner with those persons most involved with the issue. Many complaints can be resolved when a student makes an effort to honestly communicate his/her frustrations or concerns. If a student has a complaint related to a specific course he or she is enrolled in, he/she should first consult with the instructor of the course. If necessary, the student or instructor may consult with the academic department head responsible for the course for guidance on how to best resolve the student's concern.

For any complaints that the student cannot resolve informally with the parties involved, the student should contact either the Dean of Student (for non-academic-related issues) or the Associate Provost for Academic Affairs (for academic-related issues).

Questions: Contact the Student Life Office for non-academic issues or the Office of the Provost for academic-related issues

## Student Conduct: Rights, Responsibilities and Judicial Procedures

Refer to the Student Life section of this catalog

Questions: Contact the Student Life Office

## Study Abroad

International Programs section of this catalog.



Questions: Contact the Office of International Programs

## Terms and Semesters

An **academic term** consists of eleven weeks of instruction and evaluation. A **cooperative work experience term** consists of twelve weeks of supervised employment at an authorized Kettering University corporate affiliate; no credit, quality points or hours are earned through the work experience. A **semester** consists of one academic term and one cooperative work experience term for a total of twenty-three weeks. An **academic year** consists of two semesters for a total of forty-six weeks.

Questions: Contact the Office of the Registrar

## Transfer Credits

### New Transfer Students

Students transferring to Kettering University may receive earned hours for a Kettering course for which the student has taken an equivalent course, in content and level, at their previous institution.

The following conditions apply:

- Transfer Credit is accepted only from accredited colleges and universities.
- Upon receipt of transfer credit information from the Admissions Office, coursework will be evaluated for transferability to Kettering University.
- Only courses in which a C (2.0 on a 4.0 grade scale) or higher were earned will be evaluated for transfer credit.
- Only the credit will transfer. The grades do not transfer and will not affect the GPA.
- A maximum of 72 earned hours may be awarded by transfer upon admission.
- All coursework is evaluated for transfer to Kettering University regardless of a student's intended major.
- All credits awarded may not be applicable to graduation requirements. Consult with your degree department to determine how the equivalent courses will apply to your degree.
- Any requests for transfer coursework review must be submitted with any requested supporting documentation by the end of the student's first academic term.
- Final official transcripts are required to be mailed from the student's transferring institution(s) prior to registration for the next academic term.
- Transfer evaluations are processed by the Registrar's Office ([registrar@kettering.edu](mailto:registrar@kettering.edu)).

### Current Students

Students enrolled in a Kettering University degree program may take selected coursework at other institutions if the need arises and the opportunity is available. Students who want to take a course at another institution and transfer the credits to Kettering University must have the course approved prior to registration at the other institution.

The following conditions apply:

- Transfer Credit is accepted only from accredited colleges and universities.
- A [Guest Application Form](#) must be completed by the student and submitted to the Office of the Registrar for approval. NOTE: Even if a course is listed on the Course Equivalency System, it does not guarantee approval. Official approval is obtained by completing the Guest Application and receiving all required signatures of approval. The Office of the Registrar will send an email to the student's Kettering email account confirming approval or non-approval.
- Students should consult with their advisor to confirm the course being taken as guest credit will apply towards their degree requirements before registering for the course.
- A maximum of eight transfer credits are allowed while an active student, over and above approved study abroad transfer credits.
- The course must carry a grade of C (2.0) or above to transfer. Grades of C- or below are not transferable.
- Only the credit will transfer. The grades do not transfer and will not affect the GPA. Therefore, the grades cannot replace grades earned at Kettering University. This means credit for a guest course taken elsewhere can earn credit for a failed Kettering course but the Kettering course grade will remain on the student transcript and in the GPA.
- The course repeat policy only affects courses repeated at Kettering University. Guest credits do not qualify under this policy.
- Courses approved for guest credit do not eliminate pre-requisite requirements.
- Independent Study work is not transferable.
- Coursework for Kettering minors is not transferable.

### Free Elective Transfer Credits

A student's degree granting discipline may allow the transfer of a course taken outside of Kettering University even though no other academic discipline has allowed the transfer, because the course does not correspond to an existing Kettering University discipline. Such a course will be transferred as FREE-297 or FREE-497.

The following conditions apply:

- A course is eligible under this policy if the course is from an institution accredited by a U.S. regional accreditation such as North Central Association.
- A course from an institution outside the U.S. will be considered for FREE-297/497 if the course is from an institution which has been approved for transfer of courses with Kettering University equivalents.
- The course must be considered non-remedial at both Kettering University and the transfer institution.
- Courses which have a 100 or 200 level at the transfer institution will be considered for FREE-297.
- Courses which have a 300 or 400 level at the transfer institution will be considered for FREE-497.
- A minimum of 2400 classroom minutes in one or more courses is required for four credits of FREE-297/497. A number of credits different from four is not allowed.
- A student must receive academic advisement from his/her degree department before initiating the process of transferring FREE-297/497.
- The number of credits of FREE-297/497 shall be limited to the number of Free Electives in the student's degree program which have not already been fulfilled through other transfer or Kettering courses.
- Eligibility for Free-297/497 credit is determined by a student's term of admission to Kettering University.
- FREE-297/497 credit may be awarded to students admitted 200401 and beyond, Students admitted prior to 200401 are not eligible for FREE-297/497 credit for a course completed prior to January 1, 2004.
- Current Kettering students may apply for FREE-297/497 credit through the normal Application for Guest Credit process.

Questions: Contact the Office of the Registrar

## Veterans

Information on Veterans Administration, including forms and reporting services are handled in the Office of the Registrar, Room 3-309 AB.

Questions: Contact the Office of the Registrar

## Withdrawals

### Course Withdrawal

When circumstances occur whereby a student feels that completion of a course is not possible or in the student's interest, the student may request a non-punitive grade of W (withdrawn) be issued by the Registrar's Office. The following conditions apply:

- Withdrawal requests will be accepted and honored during the course withdrawal period specified on the academic calendar. After that period, the student may not withdraw from the course and is committed to receiving a Kettering letter grade, which may include a grade of FN (failure for non-attendance).
- Students must complete a [Course Withdrawal Request Form](#), have it signed by the course instructor (and advisor if the student is a freshmen or sophomore), and submit it to the Registrar's Office for processing by the deadline for course withdrawals specified on the academic calendar.
- Withdrawals are included in the number of repeat attempts.
- Refer to the Tuition and Financial Aid sections of this catalog for the refund rate schedule and how withdrawing from a course may impact financial aid.

### Term Withdrawal

Withdrawing from the term requires a completed [Undergraduate Withdrawal from University Form](#) available in the Office of the Registrar or on their website. Complete instructions and information are included on the form.

### University Withdrawal

Withdrawing from the University requires a completed [Undergraduate Withdrawal from University Form](#) available in the Office of the Registrar or on their website. Complete instructions and information are included on the form.

### Withdrawal due to Military Call to Active Duty

Students may withdraw from the University and receive a 100% tuition refund upon presenting to the Registrar, the original Armed Forces orders. Non-punitive grades of W will be issued. Should the call come during eighth week or later, in the judgment

of the instructor and the student, incompletes may be given with no reimbursement of tuition. Course work then would be completed per arrangements agreed upon by the instructor and student.

**Withdrawal – Medical/Compassionate (After 7th Friday)**

A medical/compassionate withdrawal request may be made in extraordinary cases in which serious illness or injury (medical) or another significant personal situation (compassionate) prevents a student from continuing his or her classes or withdrawing during the course withdrawal period specified on the academic calendar, and incompletes or other arrangements with the instructors are not possible.

Usually, consideration is for a complete withdrawal. All applications for withdrawal require thorough and credible documentation; however, applications for less than a complete withdrawal must be especially well documented to justify the selective nature of the partial medical/compassionate withdrawal.

A student may request and be considered for a **medical withdrawal** when extraordinary circumstances, such as a serious illness or injury prevent the student from continuing classes. The medical withdrawal policy covers both physical and mental health difficulties.

A student may request and be considered for a **compassionate withdrawal** when extraordinary personal reasons, not related to the student's personal physical or mental health (for example, a death in the student's immediate family, care of a seriously ill family member, etc.), prevent the student from continuing in classes.

All requests for medical and compassionate withdrawals must be made through the Wellness Center and require approval by the Vice President for Student Life and Dean of Students. When requesting either of these withdrawals, students must provide:

- A written statement summarizing the circumstances and providing detailed information regarding the reason for the request. If the reason for the withdrawal began or took place during the course withdrawal period specified on the academic calendar, students must provide an explanation for not withdrawing by the published deadline.
- Medical withdrawal requests must include supporting documentation from a licensed health care professional detailing the date of onset, dates of treatment, the general nature of your condition and how and why it prevented you from completing your course work, and the last date you were able to attend class. This documentation must be on official letterhead and must be specific to this request. Prescriptions and similar types of documentation will not be sufficient.
- Compassionate withdrawal requests must be accompanied by documentation pertinent to the precipitating event. For example, a compassionate withdrawal request to care for a seriously ill family member may require information similar to that for a medical withdrawal. Other required documentation may include police reports, legal documents, airline ticket receipts, newspaper clippings, etc.

Students considering requesting medical or compassionate withdrawals after the course withdrawal period specified on the academic calendar should consult with the Wellness Center as soon as possible. No refunds apply to medical or compassionate withdrawals which take place after the course withdrawal deadline.

Questions: Contact the Office of the Registrar

## INFORMATION TECHNOLOGY

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Information Technology Services (ITS) Operations is located in the Academic Building (AB), Room 2-340. All students have the privilege of using Kettering technology resources as long as they abide by the Acceptable Use of Information Technology Resources Policy, the Information Resources Policies, Etiquette & Rules and any other IT policies as documented. These documents are available on the Information Technology Services web site located on [www.kettering.edu/it](http://www.kettering.edu/it). Some of the major technical services provided to students are:

**Help Desk** - The Help Desk is located in the Academic Building (AB), Room 2-340. The Help Desk is available for technical support of our computing resources. The Help Desk is open 8:00 a.m. – 5:00 p.m., Monday through Friday, and may be contacted by phone at 810-237-8324 or by coming in person to 2-340 AB. You may also send e-mail to [helpdesk@kettering.edu](mailto:helpdesk@kettering.edu) at any time. The support staff will respond to support requests during normal business hours.

**E-mail** - All students have the privilege of having a Kettering University Google Apps e-mail account. The Kettering e-mail account is one of the official ways Kettering University faculty and staff communicate to students. Students are responsible for required actions conveyed to them through this communication vehicle, whether or not they read the message. Kettering provides each student with 25GB of e-mail server storage. Therefore, we strongly recommend that students do not auto forward to another e-mail service provider which may have less storage capacity, fewer features, and may hinder you to reply directly to the original email source. Due to the proliferation of spam and phishing emails, be advised that you may receive emails that may request personal information such as usernames and passwords. Although it may look authentic, pretending to originate from a legitimate source such as Kettering, do not respond. Immediately delete it recognizing that a legitimate source such as the Kettering IT department would never ask you to provide information such as passwords. Be cautious regarding any unsolicited email as it may contain elements that would prove to be detrimental to your computer.

**Virus Protection** - We strongly recommend that all students install virus protection software and maintain it to protect their personal PCs. Any up to date properly licensed or free virus protection software would be acceptable.

It is mandatory to have virus protection installed, current, and running when connected to the Kettering network.

**Internet Access** - Internet access is available through the Kettering University network for business and academic purposes. Faculty, staff, and students will also have access to the Internet, as well as most network resources, using their wireless devices. Students are required to use the KUSTUDENT wireless SSID for encrypted high speed access.

**Web-Based Student Services** - All students have access to a variety of on-line services through their web browser. They can view academic information such as grades, class schedules, and transcripts, as well as information about their financial account. They can also have access to view and update addresses, telephone numbers, and email addresses to facilitate communication with Kettering University faculty and staff.

**Blackboard** - Many professors utilize the Blackboard Learning Management System for course syllabi, homework assignments, and tests. Access to Blackboard is available from anywhere a student has an internet connection. To help protect your privacy, security, and confidential information, you must sign-on to Blackboard to access these services.

**Computer Labs** - The main computer labs are located in the computer wing on the 3rd floor of the Academic Building. There are computers running Windows and Linux available for student use. Students have 12GB storage on the network. Most of these are available 24 hours a day, 7 days a week unless otherwise posted. There are also various departmental labs that are regulated by the host academic department.

**Information and Help Sheets** - Help for accessing the various systems, including the Internet, is available in the IT Department Help Desk, (2-336 AB) and on the IT web site [www.kettering.edu/it](http://www.kettering.edu/it). The IT web pages contain valuable information to help maximize your use of the Kettering University computing resources.

## LIBRARY SERVICES

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### Kettering University Library

Located on the second floor of the Academic Building, the Library has a collection of over 180,000 items of print and non-print materials. The Library also subscribes to almost 400 printed periodicals, more than 17,000 unique online journals, and 42 research databases. The Library Mission focuses on service: "In support of Kettering University's mission, goals, and curriculum, the library and archives serve the university community by providing resources and services to facilitate quality teaching, learning, and research." A drop box is located near the library entrance for use when the library is closed.

### Library Catalog

Kettering University Library is a member of PALnet, an academic resource sharing library network. Searches in the library catalog can be expanded to reveal the holdings of Kettering University Library and cooperative members, Mott Community College and Baker College. For more information, or for assistance using the catalog, call 810-762-9598, or email: [library@kettering.edu](mailto:library@kettering.edu).

### Collection

Materials purchased for the library collection are to support the curriculum of Kettering University. Leisure reading material, fiction, newspapers, magazines, eBooks, DVDs and video games are also available. Special attention has been given to include the publications of American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), Society of Automotive Engineers (SAE), Society of Manufacturing Engineers (SME), and proceedings for many curriculum-related societies. Access and storage for student theses is another important part of the collection.

### Hours/Loan Information

The library is open seven days a week, with reference assistance available most of those hours. During final exam week, the library hours are extended. Changes in hours are posted on the sign just outside the library entrance and on the library's webpage ([www.kettering.edu/library](http://www.kettering.edu/library)).

Some helpful library telephone numbers include:

810-762-7814	Circulation Desk
810-762-7938	Interlibrary Loan
810-762-9598	Reference Desk
800-955-4464	Kettering University Toll-free Number

While the library is open to the public for use during all of its hours of operation, circulation of library material is restricted to Kettering University students, faculty, staff, alumni, and Friends of the Library and Archives (FOLA) members. Students, faculty and staff may renew material twice, by phone, online, or in person. The standard loan period for Kettering University Library materials is 30 days. Course reserves (e-Reserves) are available on Blackboard. Photo ID cards serve as library cards and must be presented when checking out materials. The library has 15 computer work stations and wireless connectivity (WiFi). Two Xerox multi-function devices (MFDs) provide copying, printing, and email scanning in both black and white and color. The MFDs also have the ability to scan to and print from USB storage devices and send/receive faxes. The Library has a microfilm/ microfiche viewer that can scan and print images or save images in PDF format. There are three tablets (iPad2, Microsoft Surface RT, Samsung Galaxy Tab), a laptop, and three eReaders (a Kindle DX, a Kindle Fire HD, and a Nook HD) available for borrowing. A charging station is available which can charge almost any phone or mobile device. A 27" Apple Macintosh computer is available for student audio and video projects and is pre-loaded with the Adobe Creative Suite, including Photoshop, Illustrator, and Flash. A Kurzweil Reader, which converts text to speech for students who are blind or vision-impaired, dyslexic, or those learning English as a second language, is also available.

### Interlibrary Loan

Materials not owned by the Kettering University Library can usually be obtained through Interlibrary Loan (ILL). Academic resource sharing is available to students, faculty and staff in conjunction with UM-Flint, Baker and Mott College libraries. In addition to local reciprocal agreements, the library uses OCLC WorldCat (a world-wide database of library holdings) to locate requested material. Interlibrary Loan is not a free service, but the library absorbs many of the costs which can include lender fees, postage, and copyright permissions. In cases where the total per item charge exceeds \$50, the requesting party will be asked to pay any amount exceeding the \$50 limit. ILL staff will seek approval before proceeding with the request. Please contact a Librarian or ILL Technician for assistance with your request.

### Database Access

The Library subscribes to various multi-disciplinary databases that house academic journals, newspaper and magazine articles, technical papers, conference proceedings and standards. Access is available 24/7 for all students, both on campus and off.

Popular society subscriptions include the Association for Computing Machinery (ACM), American Society of Mechanical Engineers (ASME), and the Institute of Electrical and Electronics Engineers (IEEE).

**Instruction**

Equipment or database assistance is available on an individual basis. Exposure to general and specialized library resources is also provided through instructor-requested tours.

**Kettering University Archives**

The University Archives is located on the main floor of the Campus Center. The archives document America's industrial and business heritage with particular interest in the American automobile industry, the city of Flint, and the history of Kettering University. The Charles Kettering Collection is one of the largest collections in the archives and is used by scholars worldwide. The archives' digital photo collection now exceeds 100,000 images. A collection of 375,000 vehicle patents are also found in the archives.

The archives is open to researchers Monday through Friday between 9 a.m. and 4 p.m. Students are encouraged to stop by and view the small exhibits and University memorabilia in the reading room. A partial online catalogue along with digitized photos can be found on the archives website at [kettering.edu/archives](http://kettering.edu/archives). The archives can be contacted at 810-762-9890.

## ALUMNI ENGAGEMENT

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The Office of Alumni Engagement connects and engages Kettering University alumni through gatherings and events with the end result being a dynamic relationship between the University and Alumni who will be more engaged and involved in volunteering, mentoring, recruiting, and giving back to the University.

By partnering with the Alumni Board, Admissions, Marketing, Co-op, Annual Giving, and all University Advancement, the Office of Alumni Engagement will incrementally increase each year the number of alumni engaged and giving back to the University through well-timed and meaningful programs and activities.

Each year, programming includes class reunions, Homecoming Weekend, regional alumni receptions throughout the country, company alumni “Bulldog Breakfasts,” alumni recognition ceremonies, and affinity programs directed to specific alumni. Other types of programming include the Alumni Ambassador program, the Young Alumni Council, and working with Admissions to establish Alumni Regional Networks in geo-targeted areas.

The Kettering/GMI Alumni Association Board is made up of alumni who want to give back to the University with their time, talent, and resources. The Board is comprised of five committees:

1. Student Recruitment/Alumni Involvement
2. Alumni Events
3. Alumni Awards
4. Fundraising
5. Directorship

The Kettering/GMI Alumni Association annually recognizes outstanding and notable alumni for their professional accomplishments with the following awards:

1. Alumni Service Award
2. Young Alumni Award
3. Engineering Achievement Award
4. Entrepreneurial Achievement Award
5. Management Achievement Award
6. Civic Achievement Award
7. Outstanding Achievement Award
8. Human Relations Award
9. Distinguished Alumnus/Alumna Award

The Alumni Engagement staff and Alumni Board jointly support the Student Alumni Council (SAC) on campus. SAC is a 15-student organization fostering interaction between alumni and students through various activities such as the Visiting Alumnus/Alumna Speaker Program, fundraising, Homecoming Weekend, and special workshops. SAC typically brings four alumni speakers on campus each term representing a diversity of industries, careers, and subjects students are interested in.

## INTERNATIONAL PROGRAMS

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Basem Alzahabi, Ph.D., Director  
Room 1-919 AB, 810-762-9690  
international@kettering.edu

### PROGRAM OVERVIEW

The Office of International Programs (OIP) is the pivotal focal point for international students, professors, and other visitors who come to Kettering University from around the world. The office builds strategic international partnerships with foreign academic institutions, governments, and industries to develop programs beneficial to all parties involved.

The OIP at Kettering University works closely with the Provost, President, and all officers of the University in drawing the University's strategic vision and creating mission objectives for the institution's international education. Together, we strive to execute the University's mission by integrating international and contemporary components in all academic programs and work with all academic units/departments to enhance global studies across the curriculum.

Kettering University welcomes the following international visitors:

- Full-time, degree-seeking, undergraduate and graduate students
- Short-term exchange students
- Visiting professors, scholars, and other university representatives
- Corporate employer representatives

The OIP is required by federal law to maintain certain records of international students, professors and scholars. All are required to check in at the Office of International Programs with the stamped immigration documents and passports within the first week on campus.

### SERVICES

The OIP provides a variety of services and programs to promote the success and well-being of all international visitors at Kettering University. Located in the Academic Building (1-919 AB), our staff is available to assist all international students, international faculty and international staff. The following is a list of some of the many services the OIP provides.

#### Administrative Services

- Ensure that the University maintains compliance with all applicable laws and regulations formulated by the U.S. Department of Homeland Security (DHS) and other government agencies relating to international students, international faculty, international staff, and other international visitors.
- Function as liaisons to local, state, and federal government agencies and academic institutions.
- Support and engage in efforts at the local, national, and international level promoting the value of international educational and cultural exchange.

#### Immigration Services

- Provide competent and professional services to international students, international faculty, international staff, and other international visitors concerning U.S. immigration laws regulating their stay in the United States.
- Assist all visitors in meeting obligations and requirements of federal regulations relating to their status and period of authorized stay in the United States.
- Determine eligibility and issue appropriate visa documents for entry to or change of visa classification within the United States.
- Assist academic and administrative departments regarding employment-based immigration processes for international faculty, researchers and staff members.

#### International Services

- Develop and oversee programs for the University's faculty exchange, international research programs, and fellowships.
- Develop and oversee student exchange and study-abroad programs.
- Recruit international students, oversee international activities at Kettering University, and serve as advisors to international student organizations.
- Maintain federal regulations for international visitors, export controls, and SEVIS systems for visas.
- Offer advisement on visa status maintenance for all international visitors (F-1 student visa holders, J-1- exchange students and scholars, H-1B faculty, Permanent Residency for faculty, International Guest Speakers) and all types of non-immigrant visa holders.
- Assist F-1 and J-1 students with the application processes and endorsements for various non-immigrant benefits, such as practical training programs, employment, travel, and status.



- Organize orientation programs for international students and scholars to provide international newcomers with information on immigration regulations, social opportunities, and academic issues.
- Provide assistance with insurance, bank accounts, housing, applying for a driver's license, obtaining social security cards, taxation, and other settlement concerns.

**Other areas of service include:**

- Study-Abroad Programs
- International Student Recruitment
- International Students and Visitors
- Oswald International Faculty Fellowships
- Oswald International Student Fellows Program
- Ronald G. Greenwood Memorial scholarship

**STUDY-ABROAD PROGRAMS**

The study-abroad programs at Kettering University prepare students for global leadership. Globalization and increased cooperation will require those entering the 21st-Century job market to be able to function internationally. Studying abroad will provide students with knowledge and experience that gives them a competitive edge to excel in the world market. Employers recognize that applicants who have international experience are more likely to possess the qualities in demand by our global economy.

Kettering University currently offers several study-abroad programs. All programs are offered in English and listed below by major. New study-abroad programs are continually developed, so please check with the OIP to obtain an update of new opportunities in your academic areas.

**Business**

- **Germany** at the Reutlingen University (fall term)

**Chemistry**

- **Germany** at the Reutlingen University (fall term)
- **Sweden** at Linköping University

**Computer Science**

- **Germany** at the Hochschule Furtwangen (fall term)
- **Germany** at the Hochschule Ulm (spring term)

**Electrical and Computer Engineering**

- **Germany - CE** at the Hochschule Ulm (spring term)
- **Germany - EE** at the Reutlingen University (fall term)
- **Germany - EE** at the Hochschule Ulm (spring term)

**Industrial & Manufacturing Engineering**

- **Germany** at the Reutlingen University (fall term)
- **Germany** at the Hochschule Esslingen (spring term)

**Mechanical Engineering**

- **Germany** at the Hochschule Esslingen (spring and fall)
- **Germany** at the Hochschule Konstanz (spring term)
- **Germany** at the Hochschule Ulm (fall term)
- **Germany** at the Reutlingen University (fall term)

**Development of programs with China, South Korea and Turkey**

- **China** at Yangzhou University in Yangzhou
- **China** at Tongji University in Shanghai
- **South Korea** at Ajou University in Suwon
- **South Korea** at Chungju National University in Chungju City
- **Turkey** at Yeditepe University in Istanbul

**Graduate degree program development**

- **Germany** at Hochschule Reutlingen

The study-abroad program for graduate students at Kettering University is designed for a maximum of 20 students to attend courses in Germany each spring. Admission is handled on first-come, first-served basis, so early application is encouraged.

Tuition is paid to Kettering University for all courses. All students participating in the study-abroad program must take the advanced Social Science (SSCI 398), the language course (LANG 297) and up to 3 technical courses. Full-time enrollment is defined just as it is for all other terms at Kettering University. In addition, the orientation event at the partner school is required for all students; no cost is involved. Students will receive a stipend to assist with program costs.

### Academic Requirements

Students applying for a study-abroad term must be in good academic standing, maintain a GPA of 2.5 or higher, have passing grades in all courses taken in the past two academic terms, must meet specific degree program requirements for study abroad and have degree department approval.

### Course Work

The course work taken through a Kettering University Study-Abroad Program is fully applicable toward credits in the student's degree program for up to 20 credit hours. Students may receive this maximum only if 4 credits are earned from passing a foreign language course. The study-abroad curriculum also requires participants to register for a 4 credit Advanced Social Science elective as one of the five classes taken abroad, whenever an approved class is offered by the partner institution.

### Course Credit for Laboratory Courses Taken at German Partner Universities:

Students enrolled in our German partner universities receive a grade of P or F for *laboratory* courses. In the German system, a P grade is equivalent to a C grade or higher. Kettering University students enrolled in laboratory courses at our partner German universities who receive a P grade will be granted credit for the course upon receipt of an official record.

### Courses offered at foreign universities and (Kettering University equivalent course):

Please note that this list is subject to change based on the availability of resources at the foreign universities; current information on courses offered at the foreign universities can be obtained through the OIP.

<b>Esslingen, Germany</b> vibrations) ME Spring and Fall Terms	Computer Simulation in Automotive Engineering (MECH-330 Dyn Sys with
	Basic Elements of Feedback (MECH-430 Dynamic Systems with Controls)
	Fluid Mechanics (MECH-322 Fluid Mechanics)
	Finite Element Analysis (MECH-498 or 516)
	Alternative Powertrain (MECH-498)
	Germany within Europe (SSCI-398 Advanced Social Science Elective)
<b>Furtwangen, Germany</b> CS Fall Term	Effective Java Programming (CS-398 Advanced Java Programming)
	Collaborative Systems (CS-398 Collaborative Systems)
	XML & Web Services (CS-398 Web Services)
	Mobile Interactive Applications (CS-398 Mobil Interactive Applications)
	Computer Networks (CS-498 Computer Networks)
	Cellular Networks (CS-398 Cellular Networks)
	Germany within Europe (SSCI-398 Advanced Social Science Elective)
	Logistics with Reference to SAP R/3 (MRKT-381 Fundamentals of Supply Chain Management)
	eBusiness Media and Mobility (ISYS-450 Enterprise Information System Models)
	Business Process Management (MGMT-398 Business Process)
	Controlling (ACCT-398 Controlling)
<b>Konstanz, Germany</b> ME Spring Term	Design of Mechanical Components I (MECH-312 Mechanical Component Design I)
	Fluid Mechanics (MECH-322 Fluid Mechanics)
	Heat Transfer (MECH-420 Heat Transfer)
	Germany within Europe (SSCI-398 Advanced Social Science Elective)
<b>Reutlingen, Germany</b> ME Fall Term	Special Topics in Mechanical Engineering (MECH-498 or ME Free Elective)
	International Business (BUSN-451 International Business, or ME Free Elective)
	Applied Finite Element Analysis (MECH-516 Introduction to Finite Element Analysis with Structural Application, or ME Free Elective)
	Heat Transfer (MECH-420 Heat Transfer)
	Germany within Europe (SSCI-398 Advanced Social Science Elective)
<b>Reutlingen, Germany</b>	Advanced Communication Technology (EE-340 Electromagnetic Wave Propagation)

EE, CE, IE, BUSN, CHEM Fall Term	Semiconductor Fabrication Technology (EE-427 Semiconductor Device Fundamentals) Internet Workings I (CE-480 Computer Networks) Industrial Ecology (IME-598) Lean Management (IME-498) International Business (BUSN-451 International Business) Lean Manufacturing (MGMT-461 Operations Management) European Business Law (MGMT-498) Germany within Europe (SSCI-398 Advanced Social Science Elective) Biochemistry (CHEM-351 Biochemistry I) Introduction to Macromolecular Chemistry and Lab (CHEM-4XX) Polymeric Materials and Lab (CHEM-4XX) Physical Chemistry (CHEM-361 Physical Chemistry I) Lab Instrumental Analysis (CHEM-4XX)
<b>Ulm, Germany</b> ME Fall Term	Process Automation (MECH-430 Dynamic Systems with Controls) Fluid Mechanics (MECH-322 Fluid Mechanics) CAD/CAM (MECH-498 ME Elective) Fuel Cell Principles (MECH-526/498 Fuel Cell Science & Engineering) Applied Thermal Fluids (MECH-422 Energy Systems Laboratory) Germany within Europe (SSCI-398 Advanced Social Science Elective)
<b>Ulm, Germany</b> EE, CS, and CE Spring Term	Advanced Project Work (EE-499 Independent Study) Analog Integrated Circuits (EE-420 Electronics II) Control Technology (EE-432 Feedback Control Systems) Computer Networks (CE-480 Computer Networks) Computer Architecture (CE-422 Computer Architecture and Organization) Machine Vision (CS Elective) Operating Systems (CS-451 Operating Systems) Germany within Europe (SSCI-398 Advanced Social Science Elective)

### Financial Considerations

To encourage undergraduate students to participate in the study-abroad programs, Kettering University has agreed to provide these terms as relatively “cost neutral” when compared to the expenses for tuition, room, board and transportation during a typical term on campus. Some variation should be expected.

All students who opt for an academic term abroad will register for a study-abroad term at Kettering University and pay the regular Kettering University tuition.

### Study-Abroad Stipends

Kettering University provides up to \$1,500 per student as a stipend for study-abroad programs at each degree level. Participants may use the stipend funding on multiple programs (short-term and term length), but may not exceed the \$1,500 total during each degree program at Kettering. Students must receive class credit during the study-abroad experience to be awarded the stipend. The amount of the stipend will be determined by the number of credits received from program participation.

Students are able to borrow against this stipend up to three months in advance for a small fee. This loan is intended to provide students with funds necessary for purchasing round-trip airline tickets, passports, and any other expense that needs to be covered prior to departure. Several universities abroad require either partial or total housing payment prior to arrival. This payment will be made by wire transfer and will reduce the amount available.

### Orientation

Students enrolled in a study-abroad term are required to attend orientation. The orientation will provide practical, logistical, and cultural information to prepare for studying and living overseas.

### Application

Application materials are posted online via the Blackboard system based on program location. Students are encouraged to make an appointment with an International Student Coordinator by calling (810) 762-9869 or e-mailing [international@kettering.edu](mailto:international@kettering.edu) to find out more about completing academic advising for study-abroad and gaining access to the full application. It is favorable to apply for a program one year in advance of the term a student wishes to study abroad.

### **Short-Term Study-Abroad Programs**

In an effort to give students at Kettering University more opportunities to study abroad, the OIP works closely with individual departments and faculty members to offer short-term study-abroad programs. These programs typically are one to two weeks in length, and give students the opportunity to experience a new culture while earning credit from Kettering University and traveling with familiar faculty and staff. Program fees are usually all-inclusive (covering airfare, hotel, up to two meals a day, and some activity entrance fees) and vary depending on the destination and length of the program.

The Department of Business, in conjunction with the OIP, has spearheaded the initiative to offer short-term programs to students, offering trips during the Summer and Winter Recesses. Past study-abroad sites include China and London, and future locations are determined by the department on a yearly basis. Students choosing to earn credit for one class during this program are eligible for a \$375 stipend to assist with costs.

### **INTERNATIONAL STUDENT RECRUITMENT**

The OIP at Kettering University works very closely with the Office of Admissions and the Graduate Office to continuously recruit international students through strategic partnership with international academic institutions, foreign governments, and industries.

### **INTERNATIONAL STUDENTS AND VISITORS**

#### **F-1 Students and Visitors**

The F-1 visa is used for students pursuing a degree at an academic or language institution within the United States. International students in F-1 status are generally enrolled in a full course of study. This visa is intended only for the purpose of study.

#### **J-1 Students and Visitors**

The J-1 visa is used for students as well as exchange visitors. At Kettering University, this visa is used for visiting faculty, research scholars, short-term scholars, and students.

### **Important Documents for International Students and Visitors**

#### **Passport**

The Passport is a document issued by your home country government. It is your responsibility to keep your passport valid at all times. Although passport renewal procedures vary, all passports should be renewed 6 months prior to the expiration date.

#### **I-94 Arrival Departure**

U.S. Immigration officials created this record when you entered the United States. It is an electronic record that can be retrieved online. The I-94 record shows when and where you entered the U.S., your type of visa status and how long you are eligible to stay in the United States. Students in F-1 or J-1 status are usually allowed to remain in the U.S. for the duration of status (D/S). The actual ending date of your D/S is the completion date listed on the I-20 or DS-2019 form.

#### **Visa**

Visas to enter the United States are issued by an American Consulate abroad (usually in your home country) and are stamped in your passport. It is not possible to obtain a visa stamp inside the United States. A visa allows the holder to apply for entry into the United States at the Port of Entry. In issuing a Form I-94 card at the Port of Entry, USCIS gives permission to enter the United States and grants status. The following information is listed on the visa: date issued; date the visa expires; type of visa; where it was issued; and how often the visa can be used (multiple or single).

Visitors and students must:

- Notify the OIP in advance if they terminate their study, employment, or affiliation with Kettering University earlier than the date indicated on their form I-20 or form DS-2019.
- Consult with the OIP before traveling to make sure their documents are signed.
- Obtain approval from the OIP before accepting work at other institutions or off campus.
- Apply with the OIP in a timely manner, if an extension becomes necessary.

#### **Form I-20 or Form DS-2019**

This certificate is an immigration document that indicates a particular immigration status. Form I-20 is used for F-1 students and F-2 dependents, while form DS-2019 is used for J-1 exchange visitors and J-2 dependents. Even after students have left the United States, they should retain these documents as they serve as an official record of immigration history. They can also be useful for tax purposes. Please **do not discard** old certificates.

### **SEVIS and Immigration Regulations**

SEVIS (Student & Exchange Visitor Information System) is an internet based system in which DHS (Department of Homeland Security) maintains information on non-immigrant visitors holding visas.

**Services Provided for International Visitors on Campus:**

The OIP provides services and programs that promote the success and well-being of international students and visitors at Kettering University. Our staff is available to assist all international students, scholars, and faculty.

**Visa Issuance and Maintenance**

- Assist international students in complying with federal, state and local regulations pertaining to immigration and taxation.
- Maintain immigration records on all F-1 and J-1 visitors currently enrolled at Kettering University.
- Verify change of status and lawful presences.

**Orientation**

- Check-in and visa registration.
- Evaluation of English proficiency.
- Provide international newcomers with information on:
  - immigration regulations.
  - academic issues (scheduling, help with transfer credit evaluation).
  - intercultural adjustment assistance.
- Offer guidance for international students as they negotiate the various offices of the University system.

International students must engage in a full course of study during academic terms. If you will not be enrolled full-time, you must receive **prior approval** from the OIP. The OIP is required to report under-enrollment to DHS through SEVIS within 30 days of the end of the registration period. Please come to the OIP for more information. If you have any questions regarding visa regulations or immigration laws, please contact the OIP.

**Arrangement of Cultural Activities**

Excursions are intended to promote intercultural understanding and present a broader experience of American culture.

**Required Medical Insurance Coverage**

All exchange visitors (J-1 or F-1 principles and their dependents) are required to have medical insurance and medical evacuation and repatriation insurance for the entire duration of stay in the United States. The insurance must meet the following minimum coverage requirements:

- Medical benefits of at least \$50,000 per accident or illness.
- Repatriation of remains in the amount of \$7,500.
- Expenses associated with medical evacuation of the student, scholar, or dependent to his or her home country in the amount of \$10,000.
- A deductible not to exceed \$500 per accident or illness.

**OSWALD INTERNATIONAL FACULTY FELLOWSHIPS**

The Oswald Fellowships at Kettering University sponsor international travel, teaching, and research opportunities for faculty members and are made possible by a gift from Kettering alumnus and trustee Bob Oswald '64 and his wife Marcy.

The purpose of the Oswald International Scholars Program is to increase mutual understanding as well as educational and cultural exchange involving Kettering faculty members and scholars from international institutions. Applicants are encouraged to reach out to any international institution, however, preference will be given to applications indicating collaboration with existing Kettering partners as listed: **China** at Chongqing Jiaotong University, Xi'an Polytechnic University, Dalian University of Technology, Tongji University and Yangzhou University; **Germany** at Reutlingen, Esslingen, Konstanz, Ulm, and Furtwangen; **South Korea** at Ajou University and Chungju National University; **Sweden** at Linköping University; and **Turkey** at Yeditepe University.

Through the Oswald International Scholars Program, Kettering University will assist with the costs for Kettering faculty members to work abroad during their off terms with the expectation that the international partner/host would provide support for their faculty members to spend time working on the Kettering University campus.

**OSWALD INTERNATIONAL STUDENT FELLOWS PROGRAM**

The Oswald International Student Fellows Program provides financial grants for travel and living expenses for Kettering students involved in the international exchange program. Grants are awarded twice each academic year on a competitive basis. In general, consideration is given to the financial needs of students, the student's plan for the expenditure of the grant and the country to be visited. Each spring and fall, up to 8 students per partner university will be selected as Oswald International Student Fellows based on merit and need. The selected students will receive travel grants of \$1,000 to \$2,000 in addition to the Kettering travel stipend provided for study-abroad students.

**To be eligible to become an Oswald International Student Fellow a candidate must:**

- Be in good standing at Kettering University and have been approved for study abroad by the academic department.
- Plan to participate in a study-abroad program during the upcoming fall or spring academic terms (students studying abroad in summer or winter term must check with the OIP about eligibility).
- Demonstrate a financial need.
- Complete an application including an essay by the specified deadlines. Application information will become available to students after the application deadline for a specific term.

**RONALD G. GREENWOOD MEMORIAL SCHOLARSHIP**

Business students participating in term length study-abroad programs at Kettering University are eligible to apply for the Greenwood Memorial Scholarship. Dr. Ronald G. Greenwood was a management professor at Kettering University who was instrumental in making the original contacts between Kettering and Hochschule Reutlingen to establish the study-abroad program for business students. One \$500 scholarship is awarded each fall to a business student participating in study abroad. More information can be obtained in the Office of International Programs.

For more information on our programs and services please contact the OIP by calling (810) 762-9869 or e-mailing [international@kettering.edu](mailto:international@kettering.edu).

## ACADEMIC PROGRAM INFORMATION

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### Baccalaureate Degree Programs and Concentrations

1. Bachelor of Science in Applied Biology (BSAB)
2. Bachelor of Science in Applied Mathematics (BSAM)
  - Concentrations:
    - Actuarial Science
    - Applied Statistics
    - Applied and Computational Mathematics
    - Mathematical Biology
3. Bachelor of Science in Applied Physics (BSAP)
  - Concentrations:
    - Acoustics
    - Applied Optics
    - Materials Science
    - Medical Physics
4. Bachelor of Science in Biochemistry (BSBC)
5. Bachelor of Science in Bioinformatics (BSBI)
6. Bachelor of Science in Business Administration (BSBA)
7. Bachelor of Science in Chemical Engineering (BSCHM)
8. Bachelor of Science in Chemistry (BSCH)
9. Bachelor of Science in Computer Engineering (BSCE)
10. Bachelor of Science in Computer Science (BSCS)
  - Concentrations:
    - Computer Gaming
    - System and Data Security
11. Bachelor of Science in Electrical Engineering (BSEE)
12. Bachelor of Science in Engineering Physics (BSEP)
  - Concentrations:
    - Acoustics
    - Applied Optics
    - Materials Science
    - Medical Physics
13. Bachelor of Science in Industrial Engineering (BSIE)
  - Concentrations:
    - Cognate
    - Healthcare Systems Engineering
    - International Study
    - Quality Assurance
14. Bachelor of Science in Mechanical Engineering (BSME)
  - Concentrations/Specialties:
    - Alternative Energy
    - Automotive Engineering Design
    - Bioengineering Applications
    - Machine Design & Advanced Materials

### Course of Study

1. Innovation-To-Entrepreneurship (I2E)
2. Pre-Med

### Minors

1. Acoustics
2. Applied and Computational Mathematics
3. Applied Optics
4. Biochemistry

5. Bioinformatics
6. Biology
7. Business
8. Chemistry
9. Computer Engineering
10. Computer Gaming
11. Computer Science
12. Economics
13. Electrical Engineering
14. History
15. Innovation and Entrepreneurship
16. International Studies
17. Literature
18. Manufacturing Engineering
19. Materials Science
20. Medical Physics
21. Physics
22. Pre-Law
23. Statistics
24. System and Data Security



## LIBERAL STUDIES

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**Home Department:** Liberal Studies

**Department Head:** Karen Wilkinson, Ph.D.  
Room 4-502 AB, 810-762-7827  
kwilkins@kettering.edu

### General Education

As a part of their general education, all Kettering University undergraduate students are required to take the following courses.

COMM-101 Written & Oral Communication I  
COMM-301 Written & Oral Communication II  
ECON-201 Economic Principles  
HUMN-201 Introduction to the Humanities  
LS-489 Senior Seminar: Leadership, Ethics, and Contemporary Issues  
SSCI-201 Introduction to the Social Sciences  
300 Level Humanities Elective: ART, COMM, HUMN, LIT, MUS, PHIL  
Social Science Elective: ECON, HIST, SOC, SSCI

Courses eligible for 300 level humanities and social science elective credit include:

### Humanities Elective Courses

ART-305 Art: Styles and Aesthetics  
COMM-311 Rhetorical Principles of Persuasion  
COMM-313 Rhetorical Principles of Public Speaking  
COMM-391 Topics in Communications  
HUMN-360 Technology and Culture  
HUMN-362 Global Film Cultures  
HUMN-364 Bollywood Film  
HUMN-365 Art & Nature in Early Industrial England  
HUMN-391 Topics in Humanities  
LIT-304 American Literature and Philosophy  
LIT-307 Poetry: Substance and Structure  
LIT-309 The Literature of Multicultural America  
LIT-310 African American Literature  
LIT-311 Literatures of the African Diaspora  
LIT-315 Literature of the Fantastic  
LIT-317 Masterpieces of Drama  
LIT-319 Indians, Aliens, and Others: Cross-cultural Encounters in Literature  
LIT-351 Literature in a Foreign Language  
LIT-372 Masterpieces of Literature  
LIT-374 Seminar on J.R.R. Tolkien  
LIT-379 The Plays of Shakespeare  
LIT-391 Topics in Literature  
MUS-380 Music, the Arts, and Ideas  
PHIL-373 Philosophy  
PHIL-378 Moral and Ethical Philosophy  
PHIL-391 Topics in Philosophy

### Social Science Elective Courses

ECON-342 Intermediate Microeconomics: Managerial Economics  
ECON-344 Intermediate Macroeconomics: Economic Growth and Fluctuation  
ECON-346 Introduction to Econometrics  
ECON-348 History of Economic Thought  
ECON-350 Comparative Economic Systems  
ECON-352 International Economics  
ECON-391 Topics in Economics  
HIST-306 International Relations  
HIST-308 America and the World  
HIST-310 Imperialism

HIST-312	History of Science
HIST-314	Human Conflict & Conflict Resolution
HIST-316	History of the Atlantic World
HIST-320	Modern Middle East
HIST-322	Africa in the World Economy
HIST-391	Topics in History
SOC-332	Contemporary Social Problems
SOC-335	Analysis of Social Dissent
SOC-336	Sociology of the Family
SOC-337	Religion in Society
SOC-338	Gender and Society
SOC-391	Topics in Sociology
SSCI-314	Technology and Sustainable Development
SSCI-391	Topics in Social Science

Students wishing to study a topic within the humanities and social sciences not offered as a regular course may request that a liberal studies faculty member provide an independent study course. This independent study course may not serve as a substitute for any of the courses in the general education component, including the 300-level electives and senior seminar. Written approval must be given by the instructor and Liberal Studies department head and reach the Registrar's Office no later than Friday, first week.

Besides the general education requirements, students are also able to broaden their education by choosing to use their free electives for courses beyond their majors. All Kettering University students, regardless of major, are entitled to take two courses in any area they choose. These free electives might be used to acquire a minor in a discipline within the Department of Liberal Studies.

## APPLIED BIOLOGY (Bachelor of Science)

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**Home Department:** Chemistry and Biochemistry

**Program Director:** Stacy Seeley, Ph.D.  
Room 3-103 MC, 810-762-9561  
sseeley@kettering.edu

### Program Overview

The Bachelor of Science Degree in Applied Biology provides students with a strong foundation in the principles and applications of biology. Students in the Applied Biology Program take courses in the major areas of biology including general biology, human biology, microbiology, molecular biology, cellular biology, ecology, and genetics. Additional advanced courses are required and can be chosen by the student to create a concentration of study in the biological area. All Applied Biology students will have several terms of cooperative work experience so that concepts learned in the classroom can be applied to real world problems. Students in this program will also work closely with a faculty member on a capstone research project as part of their undergraduate education and training.

An applied biology degree provides an excellent foundation for careers in biotechnology, medicine, pharmacology, environmental fields, technical management, education, business, and law.

### Program Educational Objectives

The Applied Biology Program is designed to provide its graduates a solid educational foundation on which they can build successful and sustainable careers in a biological or related field. In particular, all graduates of the Applied Biology Program will be prepared to do the following:

- To be employed or pursuing an advanced degree in the field of biology or other related disciplines.
- To be productive members of interdisciplinary teams.
- To assume leadership positions in their industry, their continuing education, or in their communities, as their careers develop.
- To continue their professional development and engage in life-long learning necessary for a sustainable career.

## Applied Biology Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Biology Core

BIOL-141/142	General Biology/Lab	4
BIOL-241/242	Human Biology/Lab	4
BIOL-311	Ecology	4
BIOL- 321	Biological Techniques I	4
BIOL-331	Biological Techniques II	4
BIOL- 361/362	Microbiology/Lab	6
BIOL-381/382	Molecular Biology/Lab	6
BIOL-441/442	Cellular Biology/Lab	6
BIOL-481	Genetics	4
BIOL-491	Advance Topics in Biology/Lab	6
BIOL- 491	Advance Topics in Biology/Lab	6
BIOL-494	Seminar/Research	<u>2</u>
<b>Total</b>		<b>56</b>

**Chemistry Core**

CHEM-137/136	General Chemistry/Principles of Chemistry Lab	4
CHEM-237/238	General Chemistry II/Lab	4
CHEM-247	Survey of Organic	4
CHEM-345/346	Organic Chemistry I/Lab	6
CHEM-347	Organic Chemistry II	4
CHEM-351/352	Biochemistry I/Lab	<u>6</u>
<b>Total</b>		<b>28</b>

**Mathematics***One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And one from:*

MATH-410	Biostatistics II	
MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

*And:*

MATH-310	Biostatistics I	<u>4</u>
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**Total** **16****Physics**

PHYS-114/115	Newtonian Mechanics and Lab	<u>4</u>
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**Total** **4****Electives**

Technical Electives <sup>4</sup>	12
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Free Electives	<u>8</u>
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**Total** **20****Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>

**Total** **4****(Minimum) Total Credits Required for Program****161<sup>1</sup>****Representative Program**

Semester	Course #	Course Name	Credit Hours
FR-I	FYE-101	First Year Foundations	1
	BIOL 141	General Biology	3
	BIOL 142	General Biology Lab	1
	CHEM 137	General Chemistry	3
	CHEM 136	General Chemistry Lab	1
	MATH 101/101X	Calculus I	4
	COMM 101	Written and Oral Communications I	<u>4</u>
			17
FR-II	BIOL 241	Human Biology	3
	BIOL 242	Human Biology Lab	1
	CHEM 237	General Chemistry II	3
	CHEM 238	General Chemistry II Lab	1
	MATH 102/102X	Calculus II	4
	ECON 201	Economic Principles	<u>4</u>
			16

SO-I	BIOL 311	Ecology	4
	BIOL 321	Biological Techniques I	4
	PHYS 114	Newtonian Mechanics	3
	PHYS 115	Newtonian Mechanics Lab	1
	(HUMN 201 or SSCI 201	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u> 16
SO-II	BIOL 331	Biological Techniques II	4
	CHEM 247	Survey of Organic Chemistry	4
	MATH 310	Biostatistics I	4
	(HUMN 201 or SSCI 201	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u> 16
JR-I	CHEM 345	Organic Chemistry I	4
	CHEM 346	Organic Chemistry I Lab	2
	BIOL 361/362	Microbiology and Lab	6
	MATH 410 or MATH 203	Biostatistics II Multivariate Calculus	<u>4</u> 16
JR-II	CHEM 347	Organic Chemistry II	4
	BIOL 381/382	Molecular Biology and Lab	6
	COMM 301	Written and Oral Communication II	4
		Technical Elective <sup>4</sup>	<u>4</u> 18
SR-I	CHEM 351	Biochemistry I	4
	CHEM 352	Biochemistry I Lab	2
	BIOL 441/442	Cellular Biology and Lab	6
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	4
		Free Elective	<u>4</u> 20
SR-II	BIOL 491	Advanced Topics in Biology	4
	BIOL 491-L	Advanced Topics in Biology Lab	2
	BIOL 481	Genetics	4
	LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
		Technical Elective <sup>4</sup>	<u>4</u> 18
SR-III	BIOL 491	Advanced Topics in Biology	4
	BIOL 491-L	Advanced Topics in Biology Lab	2
	BIOL 494	Senior Research/Seminar	2
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	4
		Free Elective	4
		Technical Elective <sup>4</sup>	<u>4</u> 20
SR-III		Culminating Undergraduate Experience	<u>4</u> 4

**(Minimum) Total Credits Required for Program****161<sup>1</sup>**

<sup>1</sup>The minimum total number of credit hours required for graduation is 161; however, the total number of credit hours taken may exceed 161. All Applied Biology majors must meet the general educational requirements and their program's requirements for a minor or concentration.

<sup>2</sup>Applied Biology students seeking a dual major must take an additional 28 earned credit hours above and beyond their first degree.

<sup>3</sup>Humanities and Social Science electives must be selected from approved 300 or 400 level courses, including one Humanities course and one Social Science course.

<sup>4</sup>A minor or concentration is required with a minimum of 12 hours of approved courses that are not required for the Applied Biology Degree. A technical elective may be any 300 or 400 level courses in BIOL, CE, CHEM, CHME, CS, EE, IME, ISYS, MATH, MECH, or PHYS that is not used to complete core degree requirements. Math 204 and Phys 224/225 can also count as a technical elective. All other courses must be approved by the department head.

## APPLIED MATHEMATICS (Bachelor of Science)

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**Home Department:** Mathematics

**Department Head:** Leszek Gawarecki, Ph.D.  
Room 2-324 AB, 810-762-9557  
lgawarec@kettering.edu

### Program Overview

Mathematics is the universal language of engineering, science, and management. Students majoring in Applied Mathematics at Kettering University select a concentration in Actuarial Science, Applied and Computational Mathematics, Applied Statistics or Mathematical Biology. The degree is very flexible in serving the interests of business and industry, preparing the student for a wide variety of careers. The degree also provides a sound preparation for graduate study. Kettering graduates in Applied Mathematics appreciate their broad-based education because it enables them to work easily with engineers, managers, and scientists. They can contribute to team approaches to problem solving.

Students with concentrations in Actuarial Science will study mathematical and statistical methods of certain actuarial models and the application of those models to insurance and other financial risks. Courses include the early stage of the actuarial exams (P, FM and MLC). The actuarial science concentration provides excellent preparation for the student interested in starting a career in the actuarial profession. It is a leading undergraduate level actuarial program by the standards of the Society of Actuaries. Actuaries are professionals who use mathematics, statistics and financial theory to analyze financial consequences of risk.

Students with concentrations in Applied and Computational Mathematics will study classical and modern mathematical topics related to scientific and engineering disciplines. Courses are included that emphasize the modeling of physical systems from theoretical and practical perspectives as well as practical scientific computations. The student will also complete an application sequence of engineering, science, or computer science courses related to the special interests of the student.

Students with concentrations in Applied Statistics will study modern statistical methods related to the acquisition, organization, analysis, and interpretation of data. Courses are included that emphasize theory and application of probability, statistics, and mathematical modeling.

Students with concentrations in Mathematical Biology will study mathematical and statistical methods related to the modeling of complex biological systems. Theoretical and numerical methods of solution will be applied to ordinary and partial differential equations and systems of equations arising in General and Human Biology, Anatomy and Physiology, and Ecology.

The curriculum for Applied Mathematics includes core mathematics courses that are common to both concentrations. These courses make up about one quarter of the total credits in the program. Considerable emphasis is placed on additional core courses in science, management and humanities.

Applied Mathematics students interact regularly with engineering and science departments through core and other required courses appropriate to the concentrations in applied and computational mathematics, applied statistics and mathematical biology. A substantial number of electives provides flexibility for greater breadth or depth of study in mathematics or its applications.

In addition to the major in Applied Mathematics, there are available minors in Applied and Computational Mathematics and Applied Statistics. Because of the strong mathematical content of Kettering's other degree programs, it is possible for many students to complete one of these minors with a modest amount of additional course work.

### Program Educational Objectives

The Mathematics Program Faculty have established the following Program Educational Objectives:

- Provide its students with a broad, fundamental understanding of foundational, mathematical and computational concepts.
- Provide the skills to use mathematics in modeling and solving real problems of mathematics, science, engineering, commerce and industry.
- Provide productive employees to science, engineering, commerce, and industry and ensure the relevance of the Applied Mathematics program through interaction with employers.

## Applied Mathematics Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Computer Programming

*Choose one from:*

CS 101	Computing and Algorithms I	
ECE-101	MATLAB and C Programming	
IME-211	Algorithms and Computer Programming	<u>4</u>
<b>Total</b>		<b>4</b>

### Basic Science

CHEM-135/136	Principles of Chemistry/Lab	4
PHYS-114/115	Newtonian Mechanics/Lab	4
PHYS-224/225	Electricity and Magnetism/Lab	<u>4</u>
<b>Total</b>		<b>12</b>

### Mathematics

*One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And one from:*

MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

*And one from:*

MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4

*And:*

MATH-305	Numerical Methods and Matrices	4
MATH-307	Matrix Algebra	4
MATH-308	Abstract Algebra	4
MATH-313	Boundary Value Problems	4
MATH-321	Real Analysis I	4
MATH-327	Mathematical Statistics I	4
MATH-412	Complex Variables	4
MATH-416	Vector Analysis	<u>4</u>
<b>Total</b>		<b>48</b>

**Concentration***Choose from:*

Actuarial Science,  
 Applied and Computational Mathematics  
 Applied Statistics  
 Mathematical Biology

**Total** **28-36**

**Electives**

Science Electives

8

Free Electives

16-24

**Total** **24-32**

**Culminating Undergraduate Experience***One from:*

CUE-495C      Co-op Thesis  
 CUE-495E      Intra/Entre/Social E-ship Thesis  
 CUE-495P      Professional Practice Thesis  
 CUE-495R      Research Thesis

4

**Total** **4**

**(Minimum) Total Credits Required for Program****161****Representative Program**

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-135	Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	MATH-101	Calculus I	4
		Computer Programming (CS-101 or IME-211 or ECE-101)	<u>4</u>
			17
FR-II	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	MATH-307	Matrix Algebra	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	(HUMN 201 or SSCI 201	Introduction to the Humanities	
		Introduction to Social Sciences)	4
	MATH-203	Multivariate Calculus	4
	MATH-308	Abstract Algebra	4
	MATH-327	Mathematical Statistics I	<u>4</u>
			16
SO-II	MATH-204	Differential Equations and Laplace Transforms	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201 or SSCI 201	Introduction to the Humanities	
		Introduction to Social Sciences)	4
		Science Elective	<u>4</u>
			16



**Actuarial Science Concentration**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
JR-I	COMM-301	Written & Oral Communication II	4
	ECON-342	Intermediate Microeconomics: Managerial Economics	4
	FINC-311	Financial Management	4
	MATH-313	Boundary Value Problems	4
	MATH-408	Probability and Statistics	<u>4</u>
			20
JR-II	MATH-305	Numerical Methods and Matrices	4
	MATH-350	Financial Mathematics	4
	ECON-344	Intermediate Macroeconomics: Economic Growth and Fluctuation	4
		Advanced Humanities or Advanced Social Science Elective	4
			16
SR-I	MATH-427	Mathematical Statistics II	4
	MATH-360	Life Contingencies I	4
	MATH-416	Vector Analysis	4
		Advanced Humanities or Advanced Social Science Elective	4
		Science Elective	<u>4</u>
			20
SR-II	MATH-321	Real Analysis I	4
	MATH-361	Life Contingencies II	4
	MATH-448	Time Series	4
		Free Electives	<u>8</u>
			20
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
	MATH-412	Complex Variables	4
		Free Electives	<u>8</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161****Applied and Computational Mathematics Concentration**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
JR-I	COMM-301	Written & Oral Communication II	4
	MATH-305	Numerical Methods and Matrices	4
	MATH-313	Boundary Value Problems	4
		Free Elective	<u>4</u>
			16
JR-II	MATH-328	Methods of Applied Mathematics	4
	MATH-418	Intermediate Differential Equations	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	<u>4</u>
			16
SR-I	MATH-416	Vector Analysis	4
		Advanced Humanities or Advanced Social Science Elective	4
		Engineering Applications/CS Sequence	4
		Free Electives	<u>8</u>
			20

SR-II	MATH-321	Real Analysis I	4
	MATH-423	Partial Differential Equations	4
		Engineering Applications/CS Sequence	4
		Free Elective	4
		Science Elective	<u>4</u>
			20
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
	MATH-412	Complex Variables	4
		Engineering Applications/CS Sequence	8
		Free Elective	<u>4</u>
			20
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

The student will develop an engineering applications or computer science sequence with the assistance of an academic advisor. The following are examples of a possible CS-sequence, EE-sequence, IME-sequence, MECH-sequence, and PHYS sequence.

#### **CS-Sequence**

CS-102	Computing and Algorithms II
CS-203	Computing and Algorithms III
CS-312	Theory of Computation
CS-415	Cryptography

#### **EE-Sequence**

EE-210	Circuits I
EE-240	Electromagnetic Fields and Applications
EE-340	Electromagnetic Wave Propagation
EE-348	Electromagnetic Compatibility

#### **IME-Sequence**

IME-251	Systems Analysis I: Engineering Cost Analysis
IME-321	Systems Modeling I: Deterministic Models
IME-423	Systems Modeling III: Stochastic Models
IME-453	Tools for Managing the Supply Chain

#### **MECH-Sequence**

MECH-210	Statics
MECH-212	Mechanics of Materials
MECH-310	Dynamics
MECH-320	Thermodynamics

#### **PHYS-Sequence**

PHYS-302	Vibration, Sound, and Light
PHYS-362	Modern Physics
PHYS-412	Theoretical Mechanics
PHYS-462	Quantum Mechanics

#### **Applied Statistics Concentration**

Semester	Course #	Course Name	Credits
JR-I	COMM-301	Written & Oral Communication II	4
	MATH-313	Boundary Value Problems	4
	MATH-408	Probability and Statistics	4
	MATH-412	Complex Variables	<u>4</u>
			16
JR-II	MATH-305	Numerical Methods and Matrices	4
	MATH-448	Time Series	4
		Free Elective	4
		Industrial/Math Elective	<u>4</u>
			16

SR-I	MATH-350	Financial Mathematics	4
	MATH-416	Vector Analysis	4
	MATH-427	Mathematical Statistics II	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	<u>4</u>
			20
SR-II	IME-333	Engineering Statistics III: Design of Experiments	4
	IME-471	Quality Systems I: Quality Assurance	4
	MATH-321	Real Analysis I	4
		Free Elective	4
		Science Elective	<u>4</u>
			20
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Electives	8
		Industrial/Math Elective	<u>4</u>
			20
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161**

The student should select at least two IME/MATH electives from the following courses:

IME-321	Systems Modeling I: Deterministic Models
IME-422	Systems Modeling II: Simulation
IME-423	Systems Modeling III: Stochastic Models
MATH-428	Sampling Theory
MATH-438	Data Analysis for Engineers and Scientists

**Mathematical Biology Concentration**

Semester	Course #	Course Name	Credits
JR-I	COMM-301	Written & Oral Communication II	4
	MATH-313	Boundary Value Problems	4
	BIOL-241	Human Biology	3
	BIOL-242	Human Biology Lab	1
	(CHEM-245 or CHEM-247)	Applied Chemistry for Engineering Survey of Organic Chemistry)	4
		Free Elective	<u>4</u>
			20
JR-II	MATH-328	Methods of Applied Mathematics	4
	MATH-418	Intermediate Differential Equations	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	<u>4</u>
			16
SR-I	MATH-416	Vector Analysis	4
	MATH-310	Biostatistics I	4
	BIOL-341	Anatomy & Physiology	4
		Advanced Humanities or Advanced Social Science Elective	4
		Science Elective	<u>4</u>
			20
SR-II	MATH-321	Real Analysis I	4
	MATH-410	Biostatistics II	4
	BIOL-441	Molecular and Cellular Biology	4
	BIOL-442	Molecular and Cellular Biology Lab	2
		Free Elective	<u>4</u>
			18

SR-III	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
	MATH-412	Complex Variables	4
	BIOL-481	Genetics	4
		Free Electives	<u>8</u>
			20
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## APPLIED PHYSICS (Bachelor of Science)

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**Home Department:** Physics

**Department Head:** Kathryn Svinarich, Ph.D.  
Room 2-323A, 810-762-7471  
[physics@kettering.edu](mailto:physics@kettering.edu)

### Program Overview

Physics is the most fundamental science and underlies the understanding of nearly all areas of science, technology, and engineering. Physics is concerned with the study of energy, space, time, matter, the interaction between material objects and the laws that govern these interactions at various scales from sub nano-scale to light-years scale. Physicists study mechanics, sound, heat, light, electric and magnetic fields, gravitation, relativity, atomic and nuclear physics, solid state physics, wave-like properties of particles and particle-like properties of radiation. Applied physics is not a specific branch of physics but the application of all branches of physics to the broad realm of practical problems in scientific and industrial applications, applied science, and advanced industry. Applied Physics (AP) is the interface between physics, applied sciences and technology; between the theory, laboratory, and practice. It involves applications of optics, acoustics, and materials in fields such as nanotechnology, telecommunications, medical physics and devices, or advanced and electronic materials. The Applied Physics degree is a flexible degree designed to interface physics with applied sciences and engineering disciplines.

The degree in Applied Physics at Kettering University provides excellent preparation for work in industry or in government agencies. The program also serves as a solid foundation for students desiring to go on to graduate school in physics or any number of fields in pure and applied science. The curriculum in Applied Physics provides a solid education in mathematics, and applied sciences and physics with emphasis on the four areas of Applied Optics, Acoustics Materials Science, nanotechnology and Medical Physics.

- Applied Physics (AP) students at Kettering take the same core physics courses as physics students at other universities. Furthermore, our Physics students are required to take a sequence of courses in optics, acoustics, and materials.
- Applied Physics (AP) students at Kettering University will graduate from the most distinctive physics program in the nation consist of the most comprehensive work integrated physics co-op in the nation, with emphasis on industrial physics that includes an industrial thesis and areas of concentrations in applied physics.
- The Applied Physics (AP) program includes a thorough background in mathematics, science, computer programming, social sciences, humanities, and communication.
- Applied Physics (AP) students complete a concentration in an area of applied science, mathematics or advanced technology or even business, pre-law, or pre-med.
- Applied Physics students complete a written senior thesis.
- The Applied Physics program at Kettering University is the first and only ABET accredited applied physics program.

For more information about the Applied Physics program, including pictures and descriptions of our laboratory facilities and minors, please visit our Web site: [www.kettering.edu/physics](http://www.kettering.edu/physics) or send an email to [physics@kettering.edu](mailto:physics@kettering.edu).

### Program Educational Objectives

The Applied Physics degree program is designed as a flexible applied program that provides graduates with a solid educational foundation that combines mathematics, science, technical knowledge, communications and liberal studies to prepare graduates for applied sciences and technical fields and interdisciplinary based career and graduate studies. The Department of Physics strives to produce Applied Physics graduates who:

- Excel in technical careers and thrive in graduate studies using scientific principles and application of physical sciences.
- Work effectively in bringing multi-disciplinary ideas to diverse professional environments.
- Improve their workplaces and communities, and the society through professional and personal activities.

## Applied Physics Program Curriculum Requirements

### First Year Experience

FYE-101 First Year Foundations

**Total**

$\frac{1}{1}$

**General Education**

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

**Chemistry***One From:*

CHEM-137/136	General Chemistry I/Principles of Chemistry Lab	
CHEM-135/136	Principles of Chemistry/Lab	4

*And one from:*

CHEM-145/146	Industrial Organic Chemistry/Lab	
CHEM-237/238	General Chemistry II/and Lab	<u>4</u>

<b>Total</b>		<b>8</b>
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**Computer Science**

CS-101	Computing and Algorithms I and Lab	<u>4</u>
<b>Total</b>		<b>4</b>

**Engineering***Choose from:*

EE-210/211	Circuits I/Lab	
EE-212/MECH-231L	Applied Electric Circuits/Signals Mechanical Systems Lab	4

*Plus*

EE-240	Electromagnetic Fields & Applications	<u>4</u>
<b>Total</b>		<b>8</b>

**Mathematics***One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And one from:*

MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

*And one from:*

MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4

*And:*

MATH-313	Boundary Value Problems	4
MATH-327	Mathematical Statistics I	4
MATH-307	Matrix Algebra	<u>4</u>

<b>Total</b>		<b>28</b>
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**Physics**

EP-235	Computers in Physics	4
EP-485	Acoustic Testing and Modeling	4
PHYS-114/115	Newtonian Mechanics/Lab	4
PHYS-224/225	Electricity and Magnetism/Lab	4
PHYS-302	Vibration, Sound, and Light	4
PHYS-342	Materials Science and Nanotechnology	4
PHYS-362	Modern Physics and Lab	4
PHYS-412	Theoretical Mechanics	4
PHYS-452	Thermodynamics and Statistical Physics	4

PHYS-462	Quantum Mechanics	4
PHYS-477	Optics and Lab	4
<i>Advanced Physics (Choose One)</i>		
EP-446	Solid State Physics	
PHYS-464	Nuclear Physics: Principles and Applications	4
<i>Topics in Physics</i>		
Any physics course that is not a core physics requirement listed above		<u>4</u>
<b>Total</b>		<b>52</b>

**Free Electives**

<b>Total</b>	<b>8</b>
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**Technical Electives**

Any 300 or 400 level Science, Math, Engineering, or Business courses approved by the academic advisor to form a sequence of courses in a specific technical field of study. Some Computer Science courses that are 100 or 200 level could be approved as a technical elective by the Physics Department Head

<b>Total</b>	<b>16</b>
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**Culminating Undergraduate Experience**

*One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>

**(Minimum) Total Credits Required for Program****161****Representative Program**

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-137 or 135	General Chemistry I or Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	CS-101	Computing and Algorithm I	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	CHEM-237 or 145	General Chemistry II or Industrial Organic Chemistry	3
	CHEM-238 or 146	General Chemistry II Lab or Industrial Organic Chemistry Lab	1
	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	MATH-203	Multivariate Calculus	4
	MATH-307	Matrix Algebra	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
SO-II	EP-235	Computers in Physics	4
	MATH-204	Differential Equations and Laplace Transforms	4
	PHYS-362	Modern Physics and Lab	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16

JR-I	(EE-210/EE-211	Circuits I and Circuits I Lab	4
	or EE-212/MECH-231L	Applied Electric Circuits/Signals for Mechanical Systems Lab)	4
	COMM-301	Written & Oral Communication II	4
	MATH-313	Boundary Value Problems	4
	PHYS-302	Vibration, Sound, and Light	<u>4</u>
			16
JR-II	EE-240	Electromagnetic Fields and Applications	4
	MATH-327	Mathematical Statistics I	4
	PHYS-342	Materials Science and Nanotechnology	4
	PHYS-412	Theoretical Mechanics	4
		Technical Elective	<u>4</u>
			20
SR-I	PHYS-462	Quantum Mechanics	4
	PHYS-477	Optics and Lab	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	4
		Technical Elective	<u>4</u>
			20
SR-II	EP-485	Acoustic Testing and Modeling	4
		Advanced Physics	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	4
		Technical Elective	<u>4</u>
			20
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
	PHYS-XXX	Topics in Physics	4
	PHYS-452	Thermodynamics and Statistical Physics	4
		Technical Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	4

**(Minimum) Total Credits Required for Program****161****Dual Options**

One of the advantages of being a Physics major is that because physics leads to or has overlaps with nearly every science and engineering discipline, it makes it very easy to pursue a dual option. Pursuing a dual option will create greater flexibility in terms of future career or graduate studies. When thinking about a dual option as a Physics major please be aware that Kettering University offers two distinct dual options as described below.

**Double Major:** Students may earn a double major as part of a single bachelor's degree by completing all course requirements for the two majors. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue a double major, obtain approval from departments for both majors. Both majors will be shown on one diploma and on the transcript.

**Two Degrees:** Students may earn two undergraduate degrees simultaneously by completing all course requirements for any two majors that in combination require at least 28 credits beyond 161 credits. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue two degrees, obtain approval from departments for both degrees. Two diplomas will be awarded and both degrees will be shown on the transcript.

- Applied Physics/Applied Mathematics
- Applied Physics/Computer Science
- Applied Physics/Electrical Engineering
- Applied Physics/Mechanical Engineering

For further information please contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).



**Physics Program Concentrations**

Applied and Engineering Physics students who wish to obtain a concentration in acoustics, applied optics, medical physics, or materials science, and have it so designated on their transcript should contact one of the following Professors: Ludwigsen (Acoustics), Vaishnava (Materials or Medical Physics) or Rablau (Optics). The basic criteria is that to obtain a concentration students must successfully complete four courses (16 credits) the same as those listed under minor programs (16 credits).

**Track of Studies and International Programs**

Applied Physics students may utilize the flexibility built in the physics curriculum to use their elective courses toward a collection of courses in a specific area of engineering or a cohesive collection of science and mathematics courses. This in particular could be useful in designing a track of study that may facilitate student participation in an existing study abroad program. This flexibility in the Physics curriculum may also be useful in better planning and preparing for future graduate studies and career. For further information about this please contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).

<sup>1</sup> Advanced Physics includes Nuclear Physics (PHYS-464) or Solid State Physics (EP-446).

<sup>2</sup> Topics in Physics includes any physics course, which is not a core physics requirement as listed above.

<sup>3</sup> Technical Electives are any 300 or 400 level Science, Math, Engineering, or Business courses approved by the academic advisor to form a sequence of courses in a specific technical field of study. Some Computer Science courses that are 100 or 200 level could be approved as a technical elective by the Physics Department Head.

## BIOCHEMISTRY (Bachelor of Science)

<b>Home Department</b>	Chemistry and Biochemistry
<b>Department Head:</b>	Stacy Seeley, Ph.D. Room 3-103 MC, 810-762-9561 sseeley@kettering.edu

### Program Overview

The Bachelor of Science Degree in Biochemistry provides students with a strong foundation in the principles of biologically-oriented chemistry and introduces students to a broad range of topics that comprise the large and dynamic field of biochemistry. Students in the biochemistry program take courses and laboratories in all of the major chemical sub-disciplines including organic chemistry, inorganic chemistry, physical chemistry and analytical chemistry. Additional special emphasis in the biological area will be achieved by taking courses and laboratories in biology and biochemistry. All Biochemistry students will have several terms of cooperative work experience so that concepts learned in the classroom can be applied to real world problems. Students in this program will also work closely with faculty members on research projects as part of their undergraduate education and training.

A Biochemistry degree provides an excellent foundation for careers in biotechnology, medicine, pharmacology, environmental fields, technical management, education, business, and law.

### Program Educational Objectives

Biochemistry Graduates will:

- Have a broad, fundamental and mathematically rigorous understanding of theoretical and experimental chemistry.
- Function effectively and ethically within an organization and society as professional chemists.
- Have the skills necessary to effectively communicate their chemical understanding to the general public and to the professional chemical community.
- Be familiar with health and safety concerns and the use of chemicals in industry.
- Be able to pursue an advanced degree.

## Biochemistry Program Curriculum Requirements<sup>1-4</sup>

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Biochemistry Core

*One From:*

CHEM-137/136	General Chemistry I/Principles of Chemistry Lab	
CHEM-135/136	Principles of Chemistry/Lab	4

*And:*

CHEM-237/238	General Chemistry II and Lab	4
CHEM-247	Survey of Organic Chemistry	4
CHEM-345/346	Organic Chemistry I and Lab	6
CHEM-347/348	Organic Chemistry II and Lab	6
CHEM-351/352	Biochemistry I and Lab	6
CHEM-361/362	Physical Chemistry I and Lab	6
CHEM-373-374	Analytical Chemistry and Lab	6
CHEM-437/438	Advanced Inorganic Chemistry and Lab	6

CHEM-451/452	Biochemistry II and Lab	6
CHEM-494	Senior Research/Seminar I	2
	Advanced Chemistry or Biology Elective and Lab	<u>6</u>
<b>Total</b>		<b>62</b>
<b>Biology Core</b>		
BIOL-141/142	General Biology and Lab	4
BIOL-241/242	Human Biology and Lab	4
BIOL-381/382	Molecular Biology and Lab	6
BIOL-481	Genetics	<u>4</u>
<b>Total</b>		<b>18</b>
<b>Mathematics</b>		
<i>One From:</i>		
MATH-101	Calculus I	
MATH-101X	Calculus I	4
<i>One From:</i>		
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4
<i>One From:</i>		
MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4
<i>One From:</i>		
(MATH-310	Biostatistics I	
MATH-408	Probability and Statistics	<u>4</u>
<b>Total</b>		<b>16</b>
<b>Physics</b>		
PHYS-114/115	Newtonian Mechanics/Lab	4
PHYS-224/225	Electricity and Magnetism/Lab	<u>4</u>
<b>Total</b>		<b>8</b>
<b>Electives</b>		
Technical Electives		12
Free Electives		<u>8</u>
<b>Total</b>		<b>20</b>
<b>Culminating Undergraduate Experience</b>		
<i>One from:</i>		
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>
<b>(Minimum) Total Credits Required for Program</b>		<b><u>161</u><sup>1</sup></b>

## Representative Program<sup>1,2</sup>

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	BIOL-141	General Biology	3
	BIOL-142	General Biology Lab	1
	(CHEM-137	General Chemistry I	
	or CHEM-135	Principles of Chemistry)	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	BIOL-241	Human Biology	3
	BIOL-242	Human Biology Lab	1
	CHEM-237	General Chemistry II	3
	CHEM-238	General Chemistry II Lab	1
	CHEM-247	Survey of Organic Chemistry	4
	MATH-102	Calculus II	<u>4</u>
			16
SO-I	CHEM-345	Organic Chemistry I	4
	CHEM-346	Organic Chemistry I Lab	2
	ECON-201	Economic Principles	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	1
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			18
SO-II	CHEM-347	Organic Chemistry II	4
	CHEM-348	Organic Chemistry II Lab	2
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	MATH-203	Multivariate Calculus	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			18
JR-I	CHEM-351	Biochemistry I	4
	CHEM-352	Biochemistry I Lab	2
	CHEM-361	Physical Chemistry I	4
	CHEM-362	Physical Chemistry I Lab	2
	COMM-301	Written & Oral Communication II	4
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	<u>4</u>
			20
JR-II	CHEM-373	Analytical Chemistry	4
	CHEM-374	Analytical Chemistry Lab	2
	CHEM-437	Advanced Inorganic Chemistry	4
	CHEM-438	Advanced Inorganic Chemistry Lab	2
		Free Elective	4
		Technical Elective <sup>4</sup>	<u>4</u>
			20
SR-I	BIOL-381	Molecular Biology	4
	BIOL-382	Molecular Biology Lab	2
		Advanced Chemistry or Biology Elective	4
		Advanced Chemistry or Biology Elective Lab	2
	(MATH-310	Biostatistics I	
	or MATH-408	Probability and Statistics)	<u>4</u>
			16

SR-II	BIOL-481	Genetics	4
	CHEM-451	Biochemistry II	4
	CHEM-452	Biochemistry II Lab	2
	CHEM-496	Senior Research/Seminar	2
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	<u>4</u>
			16
SR-III	LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
		Free Elective	4
		Technical Electives <sup>4</sup>	<u>8</u>
			16
		Culminating Undergraduate Experience	4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u><sup>1</sup></b>

<sup>1</sup>The minimum total number of credit hours required for graduation is 161; however, the total number of credit hours taken may exceed 161. All Biochemistry majors must meet the general educational requirements and their program's requirements for a minor or concentration.

<sup>2</sup>Biochemistry students seeking a dual major must take an additional 28 earned credit hours above and beyond their first degree.

<sup>3</sup>Humanities and Social Science electives must be selected from approved 300 or 400 level courses, including one Humanities course and one Social Science course.

<sup>4</sup>A minor or concentration is required with a minimum of 12 hours of approved courses that are not required for the Biochemistry Degree. A technical elective may be any course numbered 300-599 in BIOL, CE, CHEM, CHME, CS, EE, IME, ISYS, MATH, MECH, or PHYS that is not used to complete core degree requirements. Other 100-200 level courses may be used but require approval by the Department Head of Chemistry/Biochemistry.

## BIOINFORMATICS (Bachelor of Science)

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**Home Department:** Computer Science

**Department Head:** John G. Geske, Ph.D.  
Room 2-300 AB, 810-762-7963  
jgeske@kettering.edu

### Program Overview

The Bachelor of Science degree in Bioinformatics at Kettering University represents a collaborative effort between the Computer Science, Chemistry/Biochemistry and Applied Biology departments and provides students with a strong foundation in computational methods used to analyze biological systems. Students in the Bioinformatics program will obtain a strong foundation in computer software, hardware, and theory. They will also obtain a solid background in biological chemistry by taking courses and laboratories in organic chemistry, inorganic chemistry, and biochemistry. Additional special emphasis in the biological area will be achieved by taking courses and laboratories in biology. All bioinformatics students will have several terms of cooperative work experience so that concepts learned in the classroom can be applied to real world problems.

A bioinformatics degree provides an excellent foundation for careers in biotechnology, medicine, pharmacology, environmental fields, technical management, education, business, software engineering, and information systems.

### Program Educational Objectives

Graduates of the Bioinformatics Degree Program will:

- Have a broad, fundamental and mathematically rigorous understanding of theoretical and applied computer science.
- The graduates of the Bioinformatics Degree Program will have a broad and fundamental knowledge of theoretical and experimental biological chemistry.
- Have the teamwork, communication, and interpersonal skills to enable them to work effectively with interdisciplinary teams in industrial, government, academic, and medical fields.
- Understand and value the ethical implications of the bioinformatics field.
- Be able to pursue an advanced degree in Bioinformatics, Computer Science, Chemistry, Biochemistry, Molecular Biology, or Medicine.

## Bioinformatics Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Biology Core

BIOL-241	Human Biology	3
BIOL-242	Human Biology Lab	1
BIOL-381	Molecular Biology	4
BIOL-382	Molecular Biology and Lab	2
BIOL-481	Genetics	<u>4</u>
<b>Total</b>		<b>14</b>

### Biochemistry Core

CHEM-351	Biochemistry I	4
CHEM-352	Biochemistry I Lab	2
CHEM-137	General Chemistry I	3

CHEM-136	Principles of Chemistry Lab	1
CHEM-237	General Chemistry II	3
CHEM-238	General Chemistry II Lab	1
CHEM-345	Organic Chemistry I	4
CHEM-346	Organic Chemistry I Lab	2
CHEM-347	Organic Chemistry II	4
CHEM-348	Organic Chemistry II Lab	<u>2</u>
<b>Total</b>		<b>26</b>

**Computer Science Core**

CS-101	Computing and Algorithms I	4
CS-102	Computing and Algorithms II	4
CS-203	Computing and Algorithms III	4
CS-211	Discrete Mathematics	4
BINF-310	Introduction to Bioinformatics	4
CS-300	The Computing Professional	4
CS-312	Theory of Computation	4
CS-461	Database Systems	4
CS-465	Information Retrieval and Data Mining	4
BINF-490	Bioinformatics Capstone	<u>4</u>
<b>Total</b>		<b>40</b>

**Mathematics***One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*One from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And:*

MATH-310	Biostatistics I	4
MATH-410	Biostatistics II	<u>4</u>

<b>Total</b>		<b>16</b>
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**Electives**

Technical Electives	12
Free Electives	<u>16</u>
<b>Total</b>	<b>28</b>

**Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>

<b>Total</b>		<b>4</b>
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**(Minimum) Total Credits Required for Program****161****Representative Program**

Semester	Course #	Course Name	Credits
FR-1	FYE-101	First Year Foundations	1
	CHEM-137	General Chemistry I	3
	CHEM-136	Principles of Chemistry Lab	1
	CS-101	Computing and Algorithm I	4
	COMM-101	Written & Oral Communication I	4
	MATH-101	Calculus I	<u>4</u>
			17

FR-II	CHEM-237	General Chemistry II	3
	CHEM-238	General Chemistry II Lab	1
	CS-102	Computing and Algorithms II	4
	CS-211	Discrete Mathematics	4
	MATH-102	Calculus II	<u>4</u>
			16
SO-I	CHEM-345	Organic Chemistry I	4
	CHEM-346	Organic Chemistry I Lab	2
	CS-203	Computing and Algorithms III	4
	CS-300	The Computing Professional	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			18
SO-II	CHEM-347	Organic Chemistry II	4
	CHEM-348	Organic Chemistry II Lab	2
	BIOL-241	Human Biology	3
	BIOL-242	Human Biology Lab	1
	ECON-201	Economic Principles	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			18
JR-I	CHEM-351	Biochemistry I	4
	CHEM-352	Biochemistry I Lab	2
	CS-312	Theory of Computation	4
	BINF-310	Introduction to Bioinformatics	4
	MATH-310	Biostatistics I	<u>4</u>
			18
JR-II	CS-461	Database Systems	4
	COMM-301	Written & Oral Communication II	4
	MATH-410	Biostatistics II	4
		Technical Elective	4
		Free Elective	<u>4</u>
			20
SR-I	BIOL-381	Molecular Biology	4
	BIOL-382	Molecular Biology and Lab	2
		Technical Elective	4
		Free Elective	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			18
SR-II	BIOL-481	Genetics	4
	CS-465	Information Retrieval and Data Mining	4
	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			16
SR-III	BINF-490	Bioinformatics Capstone	4
		Technical Elective	4
		Free Electives	<u>8</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161**



## **BUSINESS ADMINISTRATION (Bachelor of Science)**

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**Home Department:** Business

**Department Head** Karen Cayo (Interim).  
Room 4-318 AB, 810-762-7969  
kcayo@kettering.edu

### **Program Overview**

Business 2.0 consists of a BSBA degree focused on creating dynamic project leaders capable of taking an idea or process and either bringing the idea to the market or improving the efficiency and effectiveness of a process.

There are three key aspects to achieving this:

- Business 2.0 prepares students to work with concept originators/technical colleagues and perform business analyses related to ideas and processes.
- Business 2.0 is value-added for the co-op employers as it prepares students to facilitate the idea development process and perform basic analyses.
- Business 2.0 allows students the opportunity to hone and practice their skills and knowledge in business studio (laboratory) experiences.

Students majoring in Business are required to complete the ETS (Educational Testing Service) field test in Business at the conclusion of their studies for assessment purposes.

The BSBA offers the opportunity to study abroad. Business students wishing to study abroad have the opportunity to attend classes held in English at Reutlingen University in Reutlingen, Germany. The program is one term in length, normally the SR1 term, and takes place during the fall term. Students interested in studying abroad need to make their decision no later than the JR1 term and discuss their intentions with their academic advisor. Additional information is available from the Department of Business and the Kettering University Office of International Programs.

The Department of Business offers two minors available to students not majoring in Business. These minors are: Business, and Innovation and Entrepreneurship.

The Business Minor provides students not majoring in Business with a strong base in the functional areas of business and one elective course. It also fulfills prerequisites for the Master of Business Administration (MBA), Master of Science (MS) in Engineering Management, and MS in Operations Management programs offered at Kettering University. In many cases courses in the business minor will serve prerequisites needs for MBA programs at other institutions.

The Innovation and Entrepreneurship minor is designed for students interested in starting their own business or leading the creation of new ideas in an existing business.

Since June 18, 1995 the BSBA has been accredited by the Association of Collegiate Business Schools and Programs (ACBSP). ACBSP views this as modification of the current BSBA degree and covers all of the Common Professional Components required by ACBSP.

The purpose of the BSBA is to prepare students to become dynamic leaders by coupling traditional business subjects with the ability to interact with technical colleagues and having the soft skills that enable them to lead projects and programs. The BSBA program provides the strong analytical base needed to analyze managerial, operations, and marketing data.

### **Program Educational Objectives**

1. Graduates will have the knowledge to lead projects in their organizations.
2. Graduates will have the skills and attitudes to be productive employees.

## Business Administration Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Engineering, Mathematics and Science

*One from:*

MATH-100	College Mathematics	
MATH-191	Mathematics Special Topics (PreCalculus for Business)	4

\*Students placing into MATH-101 will take an engineering/math/science elective in place of MATH-100/191

*And one from:*

MATH-101	Calculus I	
MATH-291	Mathematics Special Topics (Calculus I for Business)	4

*And:*

	Basic Science Elective	4
	Science or Engineering Elective	<u>4</u>

**Total** **16**

### Business Core

BUSN-101	Business Decision Making	4
BUSN-102	Intro to Business Methods	4
BUSN-152	Information Systems	4
BUSN-211	Management Concepts	4
BUSN-212	Organizational Behavior	4
BUSN-221	Financial Accounting	4
BUSN-222	Managerial Accounting	4
BUSN-271	Statistics for Business	4
BUSN-272	Quantitative Business Analysis	4
BUSN-331	Financial Management	4
BUSN-332	Financial Markets	4
BUSN-341	Intro to Marketing	4
BUSN-342	Product Marketing Management	4
BUSN-361	Lean Operations Management	4
BUSN-362	Lean Supply Chain Management	4
BUSN-371	Business Analytics	4
BUSN-382	Introduction to Strategy	2
BUSN-383	Strategy Integration I	2
BUSN-401	International Business	4
BUSN-402	Business Law	4
BUSN-411	Project Management	4
BUSN-482	Advance Strategy	2
BUSN-483	Strategy Integration II	2
BUSN-484	Business Design Project	4

*And one from:*

ECON-342	Intermediate Microeconomics	
ECON-344	Intermediate Macroeconomics	<u>4</u>

**Total** **92**

**Electives**

Two Business Electives	Any business courses for which the student has the prerequisites	8
Free Electives	Any course for which the student has the prerequisites	<u>8</u>
<b>Total</b>		<b>16</b>

**Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>

**(Minimum) Total Credits Required for Program****161****Representative Program**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
FR-I	FYE-101	First Year Foundations	1
	BUSN-101	Business Decision Making	4
	MATH-100/191	College Mathematics/PreCalculus for Business	4
	COMM-101	Written & Oral Communication I	4
		Science Elective	<u>4</u>
			17
FR-II	BUSN-102	Intro to Business Methods	4
	BUSN-152	Information Systems	4
	MATH-101/191	Calculus I/Calculus I for Business	4
	ECON-201	Economic Principles	<u>4</u>
			16
SO-I	BUSN-211	Management Concepts	4
	BUSN-221	Financial Accounting	4
	BUSN-271	Statistics for Business	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
SO-II	BUSN-212	Organizational Behavior	4
	BUSN-222	Managerial Accounting	4
	BUSN-272	Quantitative Business Analysis	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
JR-I	BUSN-341	Intro to Marketing	4
	BUSN-331	Financial Management	4
	BUSN-361	Lean Operations Management	4
	BUSN-371	Business Analytics	4
	COMM-301	Written & Oral Communication II	<u>4</u>
			20
JR-II	BUSN-342	Production Marketing Management	4
	BUSN-332	Financial Markets	4
	BUSN-362	Lean Supply Chain Management	4
	BUSN-382	Intro to Strategy	2
	BUSN-383	Strategy Integration I	2
		Elective	<u>4</u>
			20

SR-I	BUSN-411	Project Management	4
	BUSN-401	International Business	4
		Free Elective	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			16
SR-II	BUSN-402	Business Law	4
	BUSN-482	Advanced Strategy	2
	BUSN-483	Strategy Integration II	2
	ECON-342 or 344	Intermediate Microeconomics or Intermediate Macroeconomics	4
		Free Elective	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			22
SR-III	BUSN-484	Business Design Project	4
	LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
		Science or Econ Elective	4
		Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## CHEMICAL ENGINEERING (Bachelor of Science)

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**Home Department:** Chemistry and Biochemistry

**Program Director:** Stacy Seeley, Ph.D.  
Room 3-103 MC, 810-762-9561  
sseeley@kettering.edu

### Program Overview

Chemical engineers apply the principles of chemistry, math, and physics to the design and operation of large-scale chemical manufacturing processes. They translate processes developed in the lab into practical applications for the production of products such as plastics, medicines, detergents and fuels; design plants to maximize productivity and minimize costs; and evaluate operations for performance and product quality.

Chemical Engineers work in very diverse industries including petrochemicals, biotechnology, pharmaceuticals, alternative energy, food, health, automotive, aerospace, and the environment. Chemical Engineers will develop a broad knowledge of engineering science and environmental regulations, becoming more apt for managing projects of significant proportions. Chemical Engineers have an integrated approach towards systems and understand the complete process and its critical components. Chemical engineers affect or control the production of almost every article manufactured on an industrial scale.

Kettering University's Chemical Engineering Degree Program is a strong interdisciplinary program which draws on the strengths of our exceptional faculty, curricula, laboratories, and unique co-op component.

### Program Educational Objectives

The Chemical Engineering Program is designed to provide its graduates a solid educational foundation on which they can build successful and sustainable careers in chemical engineering or a related field. In particular, all graduates of the Chemical Engineering Program will be prepared to do the following:

- To be employed or pursuing an advanced degree in the field of chemical engineering or other related disciplines.
- To be productive members of interdisciplinary teams.
- To assume leadership positions in their industry, their continuing education, or in their communities, as their careers develop.
- To continue their professional development and engage in the life-long learning necessary for a sustainable career.

## Chemical Engineering Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Basic Sciences

*One From:*

CHEM-137/136	General Chemistry I/Principles of Chemistry Lab	
CHEM-135/136	Principles of Chemistry/Lab	4

*And:*

CHEM-237/238	General Chemistry II and Laboratory	4
CHEM-345/346	Organic Chemistry I and Laboratory	6
CHEM-347	Organic Chemistry II	4
CHEM-361/362	Physical Chemistry I and Laboratory	6
PHYS-114/115	Newtonian Mechanics and Laboratory	4

PHYS-224/225	Electricity & Magnetism and Laboratory	<u>4</u>
<b>Total</b>		<b>32</b>
<b>Mathematics</b>		
<i>One from:</i>		
MATH-101	Calculus I	
MATH-101X	Calculus I	4
<i>And one from:</i>		
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4
<i>And one from:</i>		
MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4
<i>And one from:</i>		
MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4
<i>And:</i>		
MATH-408	Probability and Statistics	<u>4</u>
<b>Total</b>		<b>20</b>
<b>Engineering Topics</b>		
CHME-100	Introduction to Chemical Engineering	4
CHME-200	Mass and Energy Balance	4
CHME-210	Chemical Engineering Thermodynamics I	4
CHME-300	Fluid Dynamics and Heat Transfer	3
CHME-301	Fluid Dynamics and Heat Transfer Laboratory	1
CHME-400	Mass Transfer and Separations	3
CHME-401	Mass Transfer and Separations Laboratory	1
CHME-410	Chemical Engineering Thermodynamics II	4
CHME-420	Applied Transport Phenomena	3
CHME-421	Applied Transport Phenomena Laboratory	1
CHME-435	Process Control	3
CHME-436	Process Control Laboratory	1
CHME-440	Senior Chemical Engineering Design I	4
CHME-450	Reaction Engineering	3
CHME-451	Reaction Engineering Laboratory	1
CHME-480	Senior Chemical Engineering Design Capstone	4
CHME-491	Advanced Chemical Engineering Elective	4
EE-212	Applied Electrical Circuits	3
IME-211	Algorithm and Computer Programming	4
MECH-231L	Signals for Mechanical Systems Lab	<u>1</u>
<b>Total</b>		<b>56</b>
<b>Electives</b>		
Technical Electives		8
Free Electives		<u>8</u>
<b>Total</b>		<b>16</b>
<b>Culminating Undergraduate Experience</b>		
<i>One from:</i>		
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>
<b>(Minimum) Total Credits Required for Program</b>		<b><u>161</u></b>

## Representative Program

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	(CHEM-137	General Chemistry I	
	or CHEM-135	Principles of Chemistry)	3
	CHEM-136	Principles of Chemistry Lab	1
	ECON-201	Economic Principles	4
	COMM-101	Written & Oral Communications	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	CHEM-237	General Chemistry II	3
	CHEM-238	General Chemistry II Lab	1
	CHME-100	Introduction to Chemical Engineering	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	CHEM-345	Organic Chemistry I	4
	CHEM-346	Organic Chemistry I Lab	2
	CHME-200	Mass & Energy Balances	4
	MATH-203	Multivariate Calculus	4
	PHYS-224	Electricity & Magnetism	3
	PHYS-225	Electricity & Magnetism Lab	<u>1</u>
			18
SO-II	CHEM-347	Organic Chemistry II	4
	MATH-204	Differential Equations & Laplace Transforms	4
	CHME-210	Chemical Engineering Thermodynamics I	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			16
JR-I	CHEM-361	Physical Chemistry I	4
	CHEM-362	Physical Chemistry I Lab	2
	CHME-300	Fluid Dynamics and Heat Transfer	3
	CHME-301	Fluid Dynamics and Heat Transfer Lab	1
	IME-211	Algorithm and Computer Programming	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			18
JR-II	CHME-450	Reaction Engineering	3
	CHME-451	Reaction Engineering Lab	1
	CHME-410	Chemical Engineering Thermodynamics II	4
	COMM-301	Written & Oral Communication II	4
		Advanced Humanities or Advanced Social Science Elective	4
		Fee Elective	<u>4</u>
			20
SR-I	CHME-400	Mass Transfer and Separations	3
	CHME-401	Mass Transfer and Separations Lab	1
	CHME-491	Advanced Chemical Engineering Elective	4
	EE-212	Applied Electrical Circuits	3
	MECH-231L	Signals for Mechanical Systems Lab	1
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			16
SR-II	CHME-435	Process Control	3
	CHME-436	Process Control Lab	1

	CHME-440	Senior Chemical Engineering Design I	4
	MATH-408	Probability and Statistics	4
		Technical Elective	4
		Free Elective	<u>4</u>
			20
SR-III	CHME-420	Applied Transport Phenomena	3
	CHME-421	Applied Transport Phenomena Lab	1
	CHME-480	Senior Chemical Engineering Design II	4
	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
		Technical Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

<sup>1</sup>The minimum total number of credit hours required for graduation is 161; however, the total number of credit hours taken may exceed 161. All Chemical Engineering majors must meet the general educational requirements and their program's requirements for a minor or concentration.

<sup>2</sup>Chemical Engineering students seeking a dual major must take an additional 28 earned credit hours above and beyond their first degree.

<sup>3</sup>Humanities and Social Science electives must be selected from approved 300 or 400 level courses, including one Humanities course and one Social Science course.

<sup>4</sup>A minor or concentration is required with a minimum of 12 hours of approved courses that are not required for the Chemical Engineering Degree. A technical elective may be any course numbered 300-599 in BIOL, CE, CHEM, CHME, CS, EE, IME, ISYS, MATH, MECH, or PHYS that is not used to complete core degree requirements. Other 100-200 level courses may be used but require approval by the Department Head of Chemistry/Biochemistry.



## CHEMISTRY (Bachelor of Science)

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**Home Department:** Chemistry and Biochemistry

**Department Head:** Stacy Seeley, Ph.D.  
Room 3-103 MC, 810-762-9561  
sseeley@kettering.edu

### Program Overview<sup>1-4</sup>

Kettering University offers a rigorous chemistry degree consistent with the guidelines for degree certification by the American Chemical Society which ensures our graduates obtain a solid chemical foundation. Students in the chemistry program take courses and laboratories in all of the major chemical sub-disciplines including organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry and biochemistry. During their senior year, chemistry majors take advanced chemistry courses in specialized areas and work closely with faculty members on a research project. This allows them to gain a deeper insight into the sub-area(s) in chemistry of their choice.

A chemistry degree provides an excellent foundation for careers in traditional chemistry areas as well as many in non-traditional areas such as technical management, education, technical writing, sales, business, and law.

### Program Educational Objectives

Chemistry Graduates will:

- Have a broad, fundamental and mathematically rigorous understanding of theoretical and experimental chemistry.
- Function effectively and ethically within an organization and society as professional chemists.
- Have the skills necessary to effectively communicate their chemical understanding to the general public and to the professional chemical community.
- Be familiar with health and safety concerns and the use of chemicals in industry.
- Be able to pursue an advanced degree.

## Chemistry Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Mathematics

*One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And one from:*

MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

*And one from:*

MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4

## Physics

## Chemistry Core

*One From:*

*And:*

## Electives

## Culminating Undergraduate Experience

*One from:*

**Total**

161<sup>1</sup>

**Representative Program<sup>1-4</sup>**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
FR-I	FYE-101	First Year Foundations	1
	(CHEM-137	General Chemistry I	
	or CHEM-135	Principles of Chemistry)	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communications I	4
	ECON-201	Economic Principles	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	CHEM-237	General Chemistry II	3
	CHEM-238	General Chemistry II Lab	1
	CHEM-247	Survey of Organic Chemistry	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	CHEM-345	Organic Chemistry I	4
	CHEM-346	Organic Chemistry I Lab	2
	MATH-203	Multivariate Calculus	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			18
SO-II	CHEM-347	Organic Chemistry II	4
	CHEM-348	Organic Chemistry II Lab	2
	MATH-204	Differential Equations & Laplace Transforms	4
	PHYS-362	Modern Physics	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			18
JR-I	CHEM-351	Biochemistry I	4
	CHEM-352	Biochemistry I Lab	2
	CHEM-361	Physical Chemistry I	4
	CHEM-362	Physical Chemistry I Lab	2
	COMM-301	Written & Oral Communication II	4
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	<u>4</u>
			20
JR-II	CHEM-363	Physical Chemistry II	4
	CHEM-364	Physical Chemistry II Lab	2
	CHEM-373	Analytical Chemistry	4
	CHEM-374	Analytical Chemistry Lab	2
		Free Elective	4
		Technical Elective <sup>4</sup>	<u>4</u>
			20
SR-I	CHEM-494	Chemistry Senior Research/Seminar	2
	(MATH-310	Biostatistics I	4
	or MATH-408	Probability and Statistics)	
		Advanced Chemistry Elective I	4
		Advanced Chemistry Elective I Lab	2
		Advanced Humanities or Advanced Social Science Elective <sup>3</sup>	<u>4</u>
			16

SR-II	CHEM-437	Advanced Inorganic Chemistry	4
	CHEM-438	Advanced Inorganic Chemistry Lab	2
		Advanced Chemistry Elective II	4
		Advanced Chemistry Elective II Lab	2
		Free Elective	<u>4</u>
			16
SR-III	LS-489	Senior Seminar:	
		Leadership, Ethics, and Contemp. Issues	4
		Free Elective	4
		Technical Electives <sup>4</sup>	<u>8</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161<sup>1</sup>**

<sup>1</sup>The minimum total number of credit hours required for graduation is 161; however, the total number of credit hours taken may exceed 161. All Chemistry majors must meet the general educational requirements and their program's requirements for a minor or concentration.

<sup>2</sup>Chemistry students seeking a dual major must take an additional 28 earned credit hours above and beyond their first degree.

<sup>3</sup>Humanities and Social Science electives must be selected from approved 300 or 400 level courses, including one Humanities course and one Social Science course.

<sup>4</sup>A minor or concentration is required with a minimum of 12 hours of approved courses that are not required for the Chemistry Degree. A technical elective may be any course numbered 300-599 in BIOL, CE, CHEM, CHME, CS, EE, IME, ISYS, MATH, MECH, or PHYS that is not used to complete core degree requirements. Other 100-200 level courses may be used but require approval by the Department Head of Chemistry/Biochemistry.

## COMPUTER ENGINEERING (Bachelor of Science)

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**Home Department:** Electrical and Computer Engineering

**Department Head:** James S. McDonald, Ph.D.  
Room 2-703E AB, 810-762-7900  
mcdonald@kettering.edu

### Program Overview

Computer engineering is a branch of engineering concerned with the design, development, and application of computer systems. The Computer Engineering (CE) program at Kettering University focuses on embedded-computer systems, in which a computer chip, module, or circuit board is built into a larger product or system. Examples of products containing embedded computers include “smart” phones, MP3 players, GPS navigation systems, hybrid and electric vehicle drive systems, unmanned vehicles, medical diagnostic devices, and manufacturing systems. Embedded systems applications span a wide range of industry sectors including consumer electronics, internet technology, computer hardware, automotive systems, and automated manufacturing. Computer engineers today can find employment in all these industries, and many more.

The program in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### Program Educational Objectives

The Computer Engineering program aims to provide each of its graduates a solid educational foundation on which he/she can build a successful and sustainable career in computer engineering or a related field. In particular, all graduates of the Computer Engineering program will have the following:

- The analysis, design, and documentation skills to qualify them for immediate employment in technical areas including;
  - a) hardware and/or software design of real-time embedded computer systems,
  - b) design of complex digital systems, especially computers, and
  - c) applications of real-time embedded-computer or other complex digital systems (in, for example, manufacturing, monitoring, control, or communications).
- The teamwork, communications, and interpersonal skills to enable them to be productive members of interdisciplinary engineering teams.
- The skills, confidence, professionalism, and experience to enable them to assume positions of technical and/or managerial leadership as their careers develop.
- A solid foundation in basic mathematics, science, and electrical and computer engineering that will enable them to continue their professional development and sustain a life-long career in computer engineering, either through graduate study or continuing self-directed learning and development activities.

The Computer Engineering program is designed to meet its objectives through its curriculum, experiential learning including cooperative education, and co-curricular activities sponsored by the department and the university.

The curriculum includes a strong sequence of mathematics and basic science courses that provides the solid foundation in these areas that is common to all engineering programs at Kettering University. Engineering design and basic engineering concepts from a variety of disciplines are introduced in the freshman year in IME-100. Basic and practical computer programming and problem solving are introduced, also in the freshman year, in ECE-101.

The “core” curriculum covers hardware design, software development in both assembly and higher-level languages, computer networking, and embedded computer applications through a combination of computer engineering, electrical engineering, and computer science courses. Every course in the core curriculum includes a strong laboratory experience, a hallmark of the program that both enhances students’ learning and hones their abilities to apply technology effectively in the workplace. A flexible selection of electives allow students to deepen their knowledge in specific areas or applications of computer engineering, or to broaden their background through dual majors or minors, or simply well chosen combinations of courses that meet their individual educational goals.

The culminating experience in the curriculum takes place in CE-490 Senior CE Design Project, which gives students experience working in a team environment to complete a large engineering project that builds on the knowledge and skills they have gained in their coursework.

The curriculum is supported by modern lab facilities for digital systems, embedded systems, computer networks, haptic systems, logic systems, parallel computing, mobile robotics, mobile application development, circuits, and electronics.

## Computer Engineering Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Mathematics and Basic Science

CS-211	Discrete Mathematics	4
And one from:		
MATH-101	Calculus I	4
MATH-101X	Calculus I	
And one from:		
MATH-102	Calculus II	4
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	
And one from:		
MATH-203	Multivariate Calculus	4
MATH-203H	Multivariate Calculus Honors	
And one from:		
MATH-204	Differential Equations and Laplace Transforms	4
MATH-204H	Differential Equations and Laplace Transforms Honors	
And:		
MATH-408	Probability and Statistics	4
PHYS-114/115	Newtonian Mechanics	4
PHYS-224/225	Electricity and Magnetism	4
	Math/Science Electives	<u>8</u>
<b>Total</b>		<b>40</b>

### Engineering Topics

CE-210	Digital Systems I	4
CE-320	Microcomputers I	4
CE-420	Microcomputers II	4
CE-422	Computer Architecture and Organization	4
CE-426	Real-Time Embedded Computers	4
CE-480	Computer Networks	4
CE-490	Senior Computer Engineering Design Project	4
ECE-101	MATLAB and C Programming	4
EE-210/211	Circuits I	4
EE-320/321	Electronics I	4
IME-100	Interdisciplinary Design and Manufacturing	4
	Computer Engineering Electives	8
	Electrical Engineering Elective	4
	Engineering Elective	<u>4</u>
<b>Total</b>		<b>60</b>

### Computer Science

CS-101	Computing and Algorithms I	4
CS-102	Computing and Algorithms II	4
	Computer Science Elective	<u>4</u>
<b>Total</b>		<b>12</b>

**Electives**

Free Electives	8
Technical Elective	<u>4</u>
<b>Total</b>	<b>12</b>

**Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>

**(Minimum) Total Credits Required for Program****161****Representative Program**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
FR-I	FYE-101	First Year Foundations	1
	COMM-101	Written & Oral Communication I	4
	IME-100	Interdisciplinary Design & Manufacturing	4
	MATH-101	Calculus I	4
		Math/Science Elective	<u>4</u>
			17
FR-II	ECE-101	MATLAB and C Programming	4
	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	CE-210	Digital Systems I	4
	MATH-203	Multivariate Calculus	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
SO-II	CE-320	Microcomputers I	4
	EE-210	Circuits I	3
	EE-211	Circuits I Lab	1
	MATH-204	Differential Equations and Laplace Transforms	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
JR-I	CE-420	Microcomputers II	4
	COMM-301	Written & Oral Communication II	4
	CS-101	Computing and Algorithms I	4
	EE-320	Electronics I	3
	EE-321	Electronics I Lab	1
	MATH-408	Probability and Statistics	<u>4</u>
			20
JR-II	CE-422	Computer Architecture and Organization	4
	CE-426	Real-Time Embedded Computers	4
	CS-102	Computing and Algorithms II	4
	CS-211	Discrete Mathematics	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			20

SR-I	CE-480	Computer Networks	4
		Advanced Humanities or Advanced Social Science Elective	4
		Computer Science Elective	4
		Electrical Engineering Elective	4
		Math/Science Elective	<u>4</u>
			20
SR-II	LS-489	Senior Seminar	4
		Computer Engineering Elective	4
		Engineering Elective	4
		Free Elective	<u>4</u>
			16
SR-III	CE-490	Senior Computer Engineering Design Project	4
		Computer Engineering Elective	4
		Free Elective	4
		Technical Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## Electives

### Computer Engineering Electives

A computer engineering elective may be any course with a CE prefix.

### Computer Science Electives

A computer science elective may be any course with a CS prefix.

### Electrical Engineering Elective

The electrical engineering elective may be any course with an EE prefix, *except* EE-212 and EE-322.

### Engineering Elective

The engineering elective may be any course with a CE, CHME, EE, IME, or MECH, prefix, *except* EE-212 and EE-322.

### Free Elective

COMM-435, MATH-100 and MATH-305 are NOT accepted for free elective credit.

### Math/Science Electives

A math/science elective may be any course with a BIOL, CHEM, MATH or PHYS prefix, *except* CHEM-171, EP-235, MATH-100, MATH-305 and PHYS-235.

### Technical Elective

The technical elective may be any course with an EE, CE, CS, MECH, IME, CHME, MATH, BIOL, CHEM, or PHYS prefix, *except* EE-212, EE-322, MATH-100, MATH-305 and CHEM-171.



## COMPUTER SCIENCE (Bachelor of Science)

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**Home Department:** Computer Science

**Department Head:** John G. Geske, Ph.D., Department Head  
Room 2-300 AB, 810-762-7963  
jgeske@kettering.edu

### Program Overview

Computer science touches virtually every aspect of human endeavor. Its impact on society is seen in the proliferation of computers, information systems, game systems, web browsers, search engines, and all the wonderful application programs that have been developed to make computers more productive and easier to use. An important aspect of the field deals with how to make programming easier, software more reliable, and the processing and retrieval of information more accessible, but fundamentally, computer science is a science of abstraction - creating the correct models for real-world problems that can be represented and manipulated inside a computer.

Computer scientists are experts on the subject of computation and information representation, both in terms of the theory of the fundamental capabilities and limitations of computation, as well as how computation can be practically realized and applied. A computer scientist understands how to design and analyze algorithms that apply computation effectively, and how to represent, store, and retrieve information efficiently, and how to design software systems to solve complex problems.

The program for Computer Science majors is broad and rigorous; students are required to have a solid foundation in computer software, hardware, and theory. Yet, the program is structured in a way that supports in-depth study of areas in and outside the computing field. Technical and free electives give students the opportunity to take advanced courses in areas of computer science such as information retrieval, computer graphics, cryptography, computer and network security, and artificial intelligence; students may elect to concentrate their studies in computer gaming, or system and data security; students can easily obtain minors in diverse fields such as applied mathematics, economics, computer engineering, and literature.

A wide variety of exciting professional and academic opportunities exist for graduates of computer science including software engineering, Internet systems and technology, security, hardware development, information systems, biotechnology, business, and consulting, as well as masters and doctoral studies in computing related fields. With the aid of a Computer Science faculty advisor, the computer science student is expected to put together a coherent program of study that supports career objectives and is true to the aims of a liberal education.

The program in Computer Science is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

### Computer Science vs. Computer Engineering

Historically, the discipline of computer science draws its roots from two separate disciplines.

- Electrical Engineering: the development of devices that depend on electricity and magnetism.
- Mathematics: the study of the properties and interactions of idealized objects, such as numbers and symbols.

Computer science lies at the intersection of these two disciplines. It is the study of a particular class of electrical devices (i.e. computers) which can perform mathematical, logical operations (i.e. software).

The computer engineering and computer science programs have a common core of classes. Students in both programs study programming, the design of digital systems, computer architecture, and operating systems, as well as a solid foundation in mathematics, science, and general education.

The computer engineering program emphasizes the design and development of physical computer systems. In addition to a common engineering core, students in computer engineering study topics such as the analysis of electrical circuits, and electronics, with an emphasis on electrical and digital design.

The computer science program emphasizes the design and development of software systems. Students in computer science study topics such as algorithms and data structures, software engineering, compiler design, database systems, artificial intelligence, and the theoretical foundations of computation.

Both programs prepare students for work in the computer industry, though with emphasis on different areas. Students should select the program which fits their skills and interests best. Both programs offer minors, so students may take additional courses in these areas and have it designated on their transcript.

**Program Educational Objectives**

1. Computer Science graduates will have sufficient depth of understanding of the fundamental areas of computer science to enable them for success in today's workplace.
2. Computer Science graduates will have sufficient breadth of understanding to enable continued professional development and lifelong learning throughout their careers.
3. Computer Science graduates will have sufficient teamwork, communication, and interpersonal skills to enable them to work with others effectively in their professional careers.
4. Computer Science graduates will be sufficiently prepared to be innovative and ethical leaders in a global society.

**Computer Science Program Curriculum Requirements****First Year Experience**

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

**General Education**

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	4
	Liberal Studies Electives	<u>8</u>
<b>Total</b>		<b>40</b>

**Basic Science**

Science Electives	<u>16</u>
<b>Total</b>	<b>16</b>

**Computer Science**

CS-101	Computing and Algorithms I	4
CS-102	Computing and Algorithms II	4
CS-202	Systems Programming Concepts	4
CS-203	Computing and Algorithms III	4
CS-211	Discrete Mathematics	4
CS-300	The Computing Professional	4
CS-312	Theory of Computation	4
CS-435	Functional Languages and Parsing	4
CS-451	Operating Systems	4
CS-471	Software Engineering	4
	Computer Science Technical Electives	<u>16</u>
<b>Total</b>		<b>56</b>

**Computer Engineering**

CE-210	Digital Systems I	4
CE-320	Microcomputers I	4
<b>Total</b>		<b>8</b>

**Mathematics***One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And:*

Mathematics Electives	<u>12</u>
<b>Total</b>	<b>20</b>

**Electives**

Free Electives

16**Total****16****Culminating Undergraduate Experience***One from:*

CUE-495C Co-op Thesis

CUE-495E Intra/Entre/Social E-ship Thesis

CUE-495P Professional Practice Thesis

CUE-495R Research Thesis

4**Total****4****(Minimum) Total Credits Required for Program****161****Representative Program**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
FR-I	FYE-101	First Year Foundations	1
	COMM-101	Written & Oral Communication I	4
	CS-101	Computing and Algorithms I	4
	MATH-101	Calculus I	4
		Science Elective <sup>1</sup>	<u>4</u>
			17
FR-II	CS-102	Computing and Algorithms II	4
	CS-211	Discrete Mathematics	4
	MATH-102	Calculus II	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			16
SO-I	CS-203	Computing and Algorithms III	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	4
		Mathematics Elective	4
		Science Elective <sup>1</sup>	<u>4</u>
			16
SO-II	CE-210	Digital Systems I	4
	CS-202	Systems Programming Concepts	4
	ECON-201	Economic Principles	4
		Science Elective <sup>1</sup>	<u>4</u>
			16
JR-I	CE-320	Microcomputers I	4
	COMM-301	Written & Oral Communication II	4
	(CS-300	The Computing Professional	4
	or CS-312	Theory of Computation <sup>2</sup> )	
		CS Technical Elective <sup>3</sup>	<u>4</u>
			16
JR-II	(CS-435	Functional Languages and Parsing	4
	or CS-471	Software Engineering <sup>2</sup> )	
		Advanced Humanities or Advanced Social Science Elective	4
		CS Technical Elective <sup>3</sup>	4
		Free Elective	4
		Mathematics Elective	<u>4</u>
			20
SR-I	CS-300	The Computing Professional	

	or CS-312	Theory of Computation <sup>2</sup>	4
		Advanced Humanities or Advanced Social Science Elective	4
		CS Technical Elective <sup>3</sup>	4
		Free Electives	<u>8</u>
			20
SR-II	CS-435 or CS-471 LS-489	Functional Languages and Parsing	
		Software Engineering <sup>2</sup>	4
		Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
		CS Technical Elective <sup>3</sup>	4
		Free Elective	4
		Mathematics Elective	<u>4</u>
			20
SR-III	CS-451	Operating Systems	4
		Liberal Studies Electives	8
		Science Elective <sup>1</sup>	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## Concentrations

The Computer Science concentrations provide students with a technical depth of study in an emerging area of interest. The student's degree remains in Computer Science, and this concentration does not prevent students from working within any government or industry position in the computer science arena. Students interested in either the Computer Gaming or System and Data Security concentrations should contact Professor John Geske, Department Head of Computer Science.

### Computer Gaming

Students majoring in Computer Science may select a concentration in Computer Gaming consisting of the following 16 credit hours of Computer Science technical electives as listed below.

#### Required Courses

CS-320	Computer Graphics
CS-385	Introduction to Game Design
CS-420	Multimedia Design
CS-485	Advanced Game Development

### System and Data Security

Students majoring in Computer Science may select a concentration in System and Data Security consisting of the following 16 credit hours of Computer Science technical electives as listed below.

#### Required Courses

CS-415	Cryptography
CS-455	Computer and Network Security
CS-458	Computer and Network Forensics
CS-459	Secure Software

<sup>1</sup> Must include two courses (8 credits) with a laboratory component.

<sup>2</sup> These courses are offered in alternate years.

<sup>3</sup> A list of approved technical electives is available from the department and listed on the department web-site

## ELECTRICAL ENGINEERING (Bachelor of Science)

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**Home Department:** Electrical and Computer Engineering

**Department Head:** James S. McDonald, Ph.D.  
Room 2-703E AB, 810-762-7900  
mcdonald@kettering.edu

### Program Overview

Electrical Engineering is a broad engineering discipline that integrates mathematical and scientific principles of electricity and magnetism to analyze electrical phenomena and to design electrical systems. The Electrical Engineering program prepares students for a wide range of careers involving design and implementation of electrical systems.

The program in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### Program Educational Objectives

The Electrical Engineering program is designed to provide its graduates a solid educational foundation on which they can build successful and sustainable careers in electrical engineering or a related field. In particular, all graduates of the Electrical Engineering program will have the following:

- The analysis, synthesis and design skills to qualify them for immediate employment or graduate study in the areas of electrical, electronic and digital systems.
- The teamwork, communications and interpersonal skills to enable them to be productive members of interdisciplinary engineering teams.
- The confidence, professionalism and experience to enable them to assume positions of technical and/or managerial leadership as their careers develop.
- A solid foundation in basic mathematics, science and electrical engineering that will enable them to continue their professional development and sustain a life-long career in electrical engineering, either through advanced course work or continuing self-directed learning and development activities.

The Electrical Engineering program is designed to meet its objectives through its curriculum, experiential learning including cooperative education, and co-curricular activities sponsored by the department and the university.

The curriculum includes a strong sequence of mathematics and basic science courses that provides the solid foundation in these areas that is common to all engineering programs at Kettering University. Engineering design and basic engineering concepts from a variety of disciplines are introduced in the freshman year in IME-100. Basic and practical computer programming and problem solving is introduced, also in the freshman year, in ECE-101.

The “core” curriculum include fundamental courses in electrical circuits, electronics, electrical signals and systems, electromagnetic, fields and waves, digital systems, and embedded computer systems. Fully half of the courses in the core curriculum include a strong laboratory experience, which both enhances students’ learning and hones their abilities to apply technology effectively in the workplace. A flexible selection of electives allow students to deepen their knowledge in specific areas or applications of electrical engineering, or to broaden their background through dual majors or minors, or simply well chosen combinations of courses that meet their individual educational goals.

The culminating experience in the curriculum takes place in EE-490 Senior EE Design Project, which gives students experience working in a team environment to complete a large engineering project that builds on the knowledge and skills they have gained in their coursework.

The curriculum is supported by modern lab facilities for analog and digital circuits and electronics, electrical machines, power electronics, control systems, high-voltage studies, haptic systems, and embedded computer systems.

## Electrical Engineering Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	1
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4

ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>
<b>Mathematics and Basic Science</b>		
CHEM-135/136	Principles of Chemistry and Lab	4
<i>And one from:</i>		
MATH-101	Calculus I	
MATH-101X	Calculus I	4
<i>And one from:</i>		
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4
<i>And one from:</i>		
MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4
<i>And one from:</i>		
MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4
<i>And:</i>		
MATH-307	Matrix Algebra	4
MATH-408	Probability and Statistics	4
PHYS-114/115	Newtonian Mechanics	4
PHYS-224/225	Electricity and Magnetism	4
	Math/Science Elective	<u>4</u>
<b>Total</b>		<b>40</b>
<b>Engineering Topics</b>		
CE-210	Digital Systems I	4
CE-320	Microcomputers I	4
ECE-101	MATLAB and C Programming	4
EE-210/211	Circuits I	4
EE-240	Electromagnetic Fields and Applications	4
EE-310	Circuits II	4
EE-320/321	Electronics I	4
EE-336	Continuous-Time Signals and Systems	4
EE-338	Discrete-Time Signals and Systems	4
EE-490	Senior Electrical Engineering Design Project	4
IME-100	Interdisciplinary Design and Manufacturing	4
	Electrical Engineering Electives	16
	Electrical or Computer Engineering Elective	<u>4</u>
<b>Total</b>		<b>64</b>
<b>Electives</b>		
Free Electives		8
Technical Electives		<u>12</u>
<b>Total</b>		<b>20</b>
<b>Culminating Undergraduate Experience</b>		
<i>One from:</i>		
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>
<b>(Minimum) Total Credits Required for Program</b>		<b><u>161</u></b>

## Representative Program

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-135	Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Laboratory	1
	COMM-101	Written & Oral Communication I	4
	IME-100	Interdisciplinary Design & Manufacturing	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	ECE-101	MATLAB and C Programming	4
	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	CE-210	Digital Systems I	4
	MATH-203	Multivariate Calculus	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
SO-II	EE-210	Circuits I	3
	EE-211	Circuits I Lab	1
	EE-240	Electromagnetic Fields and Applications	4
	MATH-204	Differential Equations and Laplace Transforms	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
JR-I	COMM-301	Written & Oral Communication II	4
	EE-336	Continuous-Time Signals and Systems	4
	EE-310	Circuits II	4
	EE-320	Electronics I	3
	EE-321	Electronics I Laboratory	1
	MATH-408	Probability and Statistics	<u>4</u>
			20
JR-II	CE-320	Microcomputers I	4
	EE-338	Discrete-Time Signals and Systems	4
	MATH-307	Matrix Algebra	4
		Advanced Humanities or Advanced Social Science Elective	4
		Electrical Engineering Elective	<u>4</u>
			20
SR-I		Advanced Humanities or Advanced Social Science Elective	4
		Electrical or Computer Engineering Elective	4
		Electrical Engineering Elective	4
		Math/Science Elective	4
		Technical Elective	<u>4</u>
			20
SR-II	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
		Electrical Engineering Elective	4
		Free Elective	4
		Technical Elective	<u>4</u>
			16

SR-III	EE-490	Senior Electrical Engineering Design Project	4
		Electrical Engineering Elective	4
		Free Elective	4
		Technical Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## Electives

### Electrical Engineering Electives

An electrical engineering elective may be any course with an EE prefix, *except* EE-212 and EE-322. At least 8 credits of electrical engineering electives must be at the 400 level or above.

### Electrical or Computer Engineering Elective

The electrical or computer engineering elective may be an electrical engineering elective or any course with a CE prefix.

### Free Elective

COMM-435, MATH-100 and MATH-305 are NOT accepted for free elective credit.

### Math/Science Elective

The math/science elective may be CS-211, or any course with a BIOL, CHEM, MATH, PHYS prefix, *except* CHEM-171, MATH-100, MATH-305 and PHYS-235.

### Technical Electives

A technical elective may be any course with an EE, CE, CS, MECH, IME, CHME, MATH, BIOL, CHEM, or PHYS prefix, *except* EE-212, EE-322, MATH-100, MATH-305 and CHEM-171.



## ENGINEERING PHYSICS (Bachelor of Science)

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**Home Department:** Physics

**Department Head:** Kathryn Svinarich, Ph.D.  
Room 2-323A, 810-762-7471  
[physics@kettering.edu](mailto:physics@kettering.edu)

### Program Overview

Physics is the most fundamental science and underlies the understanding of nearly all areas of science, technology, and engineering. Physics is concerned with the study of energy, space, time, matter, the interaction between material objects and the laws that govern these interactions at various scales from sub nano-scale to light-years scale. Physicists study mechanics, sound, heat, light, electric and magnetic fields, gravitation, relativity, atomic and nuclear physics, solid state physics, wave-like properties of particles and particle-like properties of radiation. Engineering physics is not a specific branch of physics but the application of all branches of physics to the broad realm of practical problems in scientific and industrial settings, engineering design and applications, applied science, and advanced industry. Engineering Physics (EP) is the interface of physics with specific areas of advanced or emerging technology, which are not covered in depth under the traditional engineering education such as applications of optics, acoustics, and materials in fields such as nanotechnology, telecommunications, medical physics and devices, or advanced and electronic materials. Engineering Physics degree is a flexible degree designed to interface physics with applied sciences and engineering disciplines.

The degree in Engineering Physics (EP) at Kettering University unifies the Physics knowledge applications in optics, acoustics, and advanced materials with a comprehensive engineering component emphasizing the systems engineering approach to prepare graduates for engineering applications in emerging technology. The well balanced curriculum in Engineering Physics provides a solid education combined with desirable skills that could lead to a career in industry and government sector as well as graduate studies in applied sciences and engineering.

- Engineering Physics (EP) students at Kettering take the same core physics courses as physics students at other universities. Furthermore, our Physics students are required to take a sequence of courses in optics, acoustics and materials.
- Engineering Physics (EP) students at Kettering University will graduate from the most distinctive physics program in the nation consist of the most comprehensive work integrated physics co-op in the nation, with emphasis on industrial physics that includes an industrial thesis and areas of concentrations.
- The Engineering Physics (EP) program includes a thorough background in mathematics, science, engineering fundamentals, individually designed engineering concentration, social sciences, humanities, and communication.
- Engineering Physics (EP) students have the opportunity to earn an individually designed concentration in any area of engineering that includes an engineering capstone design and combines that with a sequence of courses in the field of optics, acoustics, materials science or medical physics.
- Engineering Physics students complete a written senior thesis.
- The Engineering Physics program at Kettering University is an ABET accredited engineering physics program.

For more information about the Engineering Physics program, including pictures and descriptions of our laboratory facilities and minors, please visit our Web site: [www.kettering.edu/physics](http://www.kettering.edu/physics) or send an email to [physics@kettering.edu](mailto:physics@kettering.edu).

### Program Educational Objectives

The Engineering Physics degree program is designed as an interdisciplinary program that provides graduates with a solid educational foundation that combines mathematics, science, engineering, communications and liberal studies to prepare graduates for physics, engineering and interdisciplinary based career and graduate studies. The Department of Physics strives to produce Engineering Physics graduates who:

- Thrive in graduate studies, technical careers, or engineering practices using broad based scientific knowledge.
- Work effectively in diverse professional environments and multi-disciplinary projects.
- Improve their workplaces and communities, and the society through professional and personal activities.

## Engineering Physics Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Engineering

#### One From:

EE-210/211	Circuits I/Lab	
EE-212/MECH-231L	Applied Electric Circuits/Signals for Mechanical Systems Lab	4

#### And:

EE-240	Electromagnetic Fields and Applications	4
IME-100	Interdisciplinary Design and Manufacturing	4

#### And one from:

IME-301	Engineering Materials	
PHYS-342	Materials Science or Nanotechnology)	4

#### And:

MECH-210	Statics	4
MECH-212	Mechanics of Materials	4
	Engineering Elective Sequence <sup>1</sup>	<u>20</u>

<b>Total</b>		<b>44</b>
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### Chemistry

#### One From:

CHEM-137/136	General Chemistry I/Principles of Chemistry Lab	
CHEM-135/136	Principles of Chemistry/Lab	<u>4</u>

<b>Total</b>		<b>4</b>
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### Mathematics

#### One from:

MATH-101	Calculus I	
MATH-101X	Calculus I	4

#### And one from:

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

#### And one from:

MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

#### And one from:

MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4

#### And:

MATH-305	Numerical Methods and Matrices	4
MATH-327	Mathematical Statistics I	<u>4</u>

<b>Total</b>		<b>24</b>
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### Physics

EP-235	Computers in Physics	4
PHYS-114/115	Newtonian Mechanics and Lab	4
PHYS-224/225	Electricity and Magnetism and Lab	4

PHYS-302	Vibration, Sound and Light	4
PHYS-362	Modern Physics and Lab	4
PHYS-412	Theoretical Mechanics	4
PHYS-452	Thermodynamics and Statistical Physics	4
PHYS-462	Quantum Mechanics	4
PHYS-477	Optics and Lab	4
PHYS-485	Acoustic Testing and Modeling	4
<i>One From:</i>		
PHYS-464	Nuclear Physics: Principles and Applications	
EP-446	Solid State Physics	<u>4</u>
<b>Total</b>		<b>44</b>

**Electives**

Free Electives	<u>8</u>
<b>Total</b>	<b>8</b>

**Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>

**(Minimum) Total Credits Required for Program** **161****Representative Program**

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-137 or 135	General Chemistry I or Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	IME-100	Interdisciplinary Design and Manufacturing	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	MECH-210	Statics	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	MATH-203	Multivariate Calculus	4
	MECH-212	Mechanics of Materials	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	1
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			16
SO-II	EP-235	Computers in Physics	4
	MATH-204	Differential Equations and Laplace Transforms	4
	PHYS-362	Modern Physics	4
	(HUMN 201	Introduction to the Humanities	
	or SSCI 201	Introduction to Social Sciences)	<u>4</u>
			16

JR-I	COMM-301	Written & Oral Communication II	4
	(EE-210/EE-211	Circuits I and Circuits I Lab	
	or EE-212/MECH-231L	Applied Electric Circuits/Signals for Mechanical Systems Lab)	4
	PHYS-302	Vibration, Sound, and Light	4
		Engineering Elective Sequence <sup>1</sup>	<u>4</u>
			16
JR-II	EE-240	Electromagnetic Fields and Applications	4
	(IME-301	Engineering Materials	
	or PHYS-342	Materials Science and Nanotechnology)	4
	PHYS-412	Theoretical Mechanics <sup>2</sup>	4
	MATH-327	Mathematical Statistics	4
		Engineering Elective Sequence <sup>1</sup>	<u>4</u>
			20
SR-I	MATH-305	Numerical Methods and Matrices	4
	PHYS-462	Quantum Mechanics <sup>3</sup>	4
	PHYS-477	Optics and Lab	4
		Advanced Humanities or Advanced Social Science Elective	4
		Engineering Elective Sequence <sup>1</sup>	<u>4</u>
			20
SR-II	EP-485	Acoustic Testing and Modeling	4
	(PHYS-464	Nuclear Physics: Principles and Applications	4
	or EP-446	Solid State Physics)	
		Advanced Humanities or Advanced Social Science Elective	4
		Engineering Elective Sequence <sup>1</sup>	4
		Free Elective	<u>4</u>
			20
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
	PHYS-452	Thermodynamics and Statistical Physics	4
		Engineering Capstone Design Course <sup>1</sup>	4
		Free Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161****Dual Options**

One of the advantages of being a Physics major is that because physics leads to or has overlaps with nearly every science and engineering discipline, it makes it very easy to pursue a dual option. Pursuing a dual option will create greater flexibility in terms of future career or graduate studies. When thinking about a dual option as a Physics major please be aware that Kettering University offers two distinct dual options as described below.

**Double Major:** Students may earn a double major as part of a single bachelor's degree by completing all course requirements for the two majors. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue a double major, obtain approval from departments for both majors. Both majors will be shown on one diploma and on the transcript.

**Two Degrees:** Students may earn two undergraduate degrees simultaneously by completing all course requirements for any two majors that in combination require at least 28 credits beyond 161 credits. If capstone courses are required in both majors, both must be completed. Only one thesis is required. To pursue two degrees, obtain approval from departments for both degrees. Two diplomas will be awarded and both degrees will be shown on the transcript.

- Engineering Physics/Applied Mathematics
- Engineering Physics/Computer Science
- Engineering Physics/Electrical Engineering
- Engineering Physics/Mechanical Engineering

For further information please contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).

**Physics Program Concentrations**

Applied and Engineering Physics students who wish to obtain a concentration in acoustics, applied optics, medical physics, or materials science, and have it so designated on their transcript should contact one of the following Professors: Ludwigsen (Acoustics), Vaishnava (Materials or Medical Physics) or Rablau (Optics). The basic criteria is that to obtain a concentration students must successfully complete four courses (16 credits) the same as those listed under minor programs (16 credits).

**Track of Studies and International Programs**

Engineering Physics students may utilize the flexibility built in the physics curriculum to use their elective courses toward a collection of courses in a specific area of engineering or a cohesive collection of science and mathematics courses. This in particular could be useful in designing a track of study that may facilitate student participation in an existing study abroad program. This flexibility in the Physics curriculum may also be useful in better planning and preparing for future graduate studies and career. For further information about this please contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).

<sup>1</sup> Engineering Electives are any 300 or 400 level Engineering or Applied Sciences courses approved by the academic advisor to form a sequence of courses in a specific Engineering or technical field of study (in some cases, this may also include one or more courses in Science, Math, or Business necessary to complete an engineering sequence, such as fuel cell sequence). Engineering sequence courses will be designed based on individual student interests and their future career or graduate studies plans and in some cases may satisfy a minor program requirements.

## INDUSTRIAL ENGINEERING (Bachelor of Science)

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**Home Department:** Industrial and Manufacturing Engineering

**Department Head:** Vacant  
Contact the Industrial and Manufacturing Engineering Department

### Program Overview

The Department of Industrial & Manufacturing Engineering offers a degree in Industrial Engineering. The department emphasizes development of the student's ability to analyze operational requirements and to design processes that systematically integrate customer needs, technology, and economic and social factors for industrial, service, and governmental organizations.

Industrial Engineering (IE) is a discipline known for its breadth of scope and application. The preparation received in industrial engineering is valuable in virtually all industrial, commercial and governmental activities which are engaged in the manufacture of a product or the provision of a service. Graduates typically are responsible for the design of integrated systems at one of two levels.

The first level may be described as the "human activity systems" level and is concerned with the design of the physical workplace at which human activity occurs. The second level, the "management control system" level, is concerned with planning, measuring and controlling the activities of the organization for the optimal utilization of its resources. The utilization of computers and the development of the associated software are integral parts of both levels of systems design. Industrial Engineers are concerned with systematic design and integration of people, raw materials, facilities, information, and energy to produce safe and quality products and/or services at an affordable cost to the consumer.

The Industrial Engineering curriculum develops both the engineering theory and the practical background and people skills necessary to design optimal productive work and management control systems for an organization. The Industrial Engineering curriculum is designed to provide the student with a sound theoretical background while being oriented toward applied problem-solving. Classroom instruction is backed by hands-on application in well-equipped laboratory facilities in Computer Graphics, Computer Software Development, Human Factors (ergonomics), Manufacturing Materials and Processes, Methods Analysis, Networked Microcomputers, and Physical Simulation.

The program in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### Program Educational Objectives

During the 5-8 years following completion of the Bachelor of Science in Industrial Engineering Degree, our graduates will:

- Use principles of Industrial Engineering to work successfully with a variety of people to further the aims and objectives of themselves, their organization and others.
- Grow professionally, having increased their level of authority, contribution, leadership and teamwork.
- Demonstrate their ability to increase their knowledge in ways most appropriate for their goals.
- Meet personal career goals.

## Industrial Engineering Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Basic Sciences

CHEM-135/136	Principles of Chemistry/Lab	4
PHYS-114/115	Newtonian Mechanics/Lab	4

PHYS-224/225	Electricity & Magnetism/Lab	4
	Science or Math Electives <sup>1</sup>	<u>8</u>
<b>Total</b>		<b>20</b>
<b>Engineering Core</b>		
IME-100	Interdisciplinary Design and Manufacturing	4
MECH-100	Engineering Graphical Communication	4
MECH-210	Statics	<u>4</u>
<b>Total</b>		<b>12</b>
<b>Industrial Engineering Core</b>		
IME-211	Algorithms and Computer Programming	4
IME-251	Systems Analysis I: Engineering Cost Analysis	4
IME-301	Engineering Materials	4
IME-321	Systems Modeling I: Deterministic Models	4
IME-332	Engineering Statistics II: Statistical Inference and Regression	2 <sup>2</sup>
IME-333	Engineering Statistics III: Design of Experiments	2 <sup>2</sup>
IME-361	Work Design I: Methods & Standards	4
IME-412	Applied Control Systems Design	4
IME-422	Systems Modeling II: Simulation	4
IME-452	Designing Value in the Supply Chain	4
IME-453	Tools for Managing the Supply Chain	4
IME-454	Senior Design Project	4
IME-462	Work Design II: Ergonomics	4
IME-471	Quality Systems I: Quality Assurance	<u>4</u>
<b>Total</b>		<b>52</b>
<b>Mathematics</b>		
IME-332	Eng Stats II: Statistical Inference and Regression	2 <sup>2</sup>
IME-333	Engineering Statistics III: Design of Experiments	2 <sup>2</sup>
<i>One from:</i>		
MATH-101	Calculus I	
MATH-101X	Calculus I	4
<i>And one from:</i>		
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4
<i>And one from:</i>		
MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4
<i>And:</i>		
MATH-310	Biostatistics I <sup>3</sup>	<u>4</u>
<b>Total</b>		<b>20</b>
<b>Concentration</b>		
Industrial Engineering Cognate (three IME electives)		<u>12</u>
<b>Total</b>		<b>12</b>
<b>Electives</b>		
Free Electives <sup>3</sup>		
(Both IME and Free electives may be used to complete a non-IE minor)		<u>8</u>
<b>Total</b>		<b>8</b>
<b>Culminating Undergraduate Experience</b>		
<i>One from:</i>		
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>
<b>Total</b>		<b>4</b>
<b>(Minimum) Total Credits Required for Program</b>		<b><u>161</u></b>

## Representative Program

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-135	Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	IME-100	Interdisciplinary Design and Manufacturing	4
	MATH-101	Calculus I	<u>4</u>
			17
FR-II	ECON-201	Economic Principles	4
	MATH-102	Calculus II	4
	MECH-100	Engineering Graphical Communication	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	<u>1</u>
			16
SO-I	IME-211	Algorithms & Computer Programming	4
	MATH-203	Multivariate Calculus	4
	MECH-210	Statics	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	<u>1</u>
			16
SO-II	IME-251	Systems Analysis I: Engineering Cost Analysis	4
	MATH-310	Biostatistics I	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	4
		Science or Math Elective <sup>1</sup>	<u>4</u>
			16
JR-I	IME-301	Engineering Materials	4
	IME-321	Systems Modeling I: Deterministic Models	4
	IME-332	Eng. Statistics II: Statistical Inference and Regression	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
JR-II	COMM-301	Written & Oral Communication II	4
	IME-333	Engineering Statistics III: Design of Experiments	4
	IME-361	Work Design I: Methods & Standards	4
	IME-452	Designing Value in the Supply Chain	4
		Science or Math Elective <sup>1</sup>	<u>4</u>
			20
SR-I	IME-422	Systems Modeling II: Simulation	4
	IME-453	Tools for Managing the Supply Chain	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	4
		IE Concentration Elective I	<u>4</u>
			20
SR-II	IME-412	Applied Control Systems Design	4
	IME-462	Work Design II: Ergonomics	4
	IME-471	Quality Systems I: Quality Assurance	4
		Advanced Humanities or Advanced Social Science Elective	4
		IE Concentration Elective II	<u>4</u>
			20
SR-III	IME-454	Senior Design Project	4
	LS-489	Senior Seminar:	



Leadership, Ethics and Contemp. Issues	4
Free Elective	4
IE Concentration Elective III	<u>4</u>
	16
Culminating Undergraduate Experience	<u>4</u>
	4

**(Minimum) Total Credits Required for Program****161**

<sup>1</sup>The Science or Math Elective may be any course with a MATH, CHEM, PHYS or BIOL prefix except MATH-100, MATH-408 (if student has taken MATH-310), CHEM-171 and PHYS-235.

<sup>2</sup>The credits for Engineering Statistics II and III are split between Industrial Engineering Core and Mathematics

<sup>3</sup>Students taking MATH-310 (Biostatistics I) may not take MATH-408 (Probability and Statistics) as an elective, including as a free elective. MATH-408 may only be substituted for MATH-310 with Department Head approval.

## Dual Degrees in Industrial Engineering and Mechanical Engineering

A coordinated program is available to earn both a Bachelor of Science in Industrial Engineering and a Bachelor of Science in Mechanical Engineering in 193 credits (189 credits of course work and 4 thesis credits). A student can complete the program in 10 or 11 academic terms at Kettering University. During the first three terms, a student can follow the representative program for either degree. The following representative program is intended as a guide to assist the student in planning for the remaining terms. An eligible student may be able to avoid a SR-V term by one of the following three methods: 1) take 5 courses per term for one term prior to JR-1, 2) take 6 courses per term for one term after SO-II, or 3) take Kettering or guest courses during a work term. It is the student's responsibility to determine that all requirements are satisfied for both programs. The student must be advised by both programs each term.

## Dual Degrees in Industrial Engineering and Mechanical Engineering Representative Program

FR I through SOI Representative Program Credit Total:

**49**

Semester	Course #	Course Name	Credits
SO-II	ECON-201	Economic Principles	4
	EE-212	Applied Electrical Circuits	3
	and MECH-231L	Signals for Mechanical Systems Lab	1
	MATH-204	Differential Equations and Laplace Transforms	4
	MECH-212	Mechanics of Materials	<u>4</u>
			16
JR-I	IME-211	Algorithms and Computer Programming	4
	MECH-300	Computer Aided Engineering	4
	MECH-310	Dynamics	4
	MECH-311	Introduction to Mechanical System Design	4
	MECH-312	Mechanical Component Design I	<u>4</u>
			20
JR-II	COMM-301	Written & Oral Communications II	4
	IME-251	Systems Analysis I, Engineering Cost Analysis	4
	IME-301	Engineering Materials	4
	MATH-408	Probability and Statistics	4
	MECH-320	Thermodynamics	<u>4</u>
			20
SR-I	IME-321	Systems Modeling I, Deterministic Models	4
	IME-332	Eng. Statistics II, Statistical Inference and Regression	4
	MATH-305	Numerical Methods and Matrices	4
	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	<u>4</u>
			20

SR-II	IME-333	Engineering Statistics III, Design of Experiments	4
	IME-361	Work Design I, Methods & Standards	4
	IME-452	Designing Value in the Supply Chain	4
	MECH-420	Heat Transfer	4
	MECH-430	Dynamic Systems with Controls	<u>4</u>
			20
SR-III	IME-422	Systems Modeling II: Simulation	4
	IME-453	Tools for Managing the Supply Chain	4
	MECH-422	Energy Systems Laboratory	4
		Advanced Humanities or Advanced Social Science Elective	4
		ME Senior Design Project	<u>4</u>
			20
SR-IV	IME-412	Applied Control Systems Design	4
	IME-454	[IE] Senior Design Project	4
	IME-462	Work Design II, Ergonomics	4
	IME-471	Quality Systems I, Quality Assurance	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			20
SR-V	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	<u>4</u>
			4
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## Concentrations

Students in Industrial Engineering (IE) have the opportunity to complete a concentration within the degree program. A concentration is for a student to gain specialized knowledge within a particular area of IE. Concentrations may be defined by choices made for the IE concentration electives. Available concentrations in IE are:

### **Cognate:**

Any 3 IME electives

### **Healthcare Systems Engineering**

IME-456 Healthcare Systems Engineering

IME-476 Lean Six-Sigma

HMGT-409 Healthcare Management

### **International Study:**

IE students participating in the international study program may use some courses taken abroad as IE and free electives.

### **Quality Assurance:**

IME-572 Introduction to Reliability & Maintainability

IME-573 Advanced Quality Assurance

IME-474 Design for Manufacture & Assembly or IME-575 Failure Analysis

NOTE: A certificate in Six-Sigma fundamentals can be earned by completing IME-572 and IME-573

They may also use their electives for the Manufacturing Minor from the Department of Industrial and Manufacturing Engineering (IME), or a minor from another department. Current information on courses can be obtained from the Department of IME.

## Minors

Many academic departments offer minors. Refer to the department offering the minor for details. Popular minors among IE students include the Business Minor and the Applied Statistics Minor. IME offers the Manufacturing Minor, which is available to all students. Courses required for the Manufacturing Minor are:

- IME-301 Engineering Materials
- IME-403 CNC Machining
- IME-409 Computer Integrated Manufacturing
- IME Process Elective
- IME Integration Elective
- Additional process or integration course or IME-499 Independent Study

Students may also use electives for the Manufacturing Minor from the Department of Industrial and Manufacturing Engineering (IME), or a minor from another department. Current information on courses can be obtained from IME.

## Bachelor-Master Programs

A Bachelor-Master Program in Manufacturing Engineering is available to students in all undergraduate engineering programs, provided that they meet University criteria for such programs. The program consists of ten courses, or forty credits. This program provides the opportunity to take two 500-level IME courses during the Senior year that can count toward both undergraduate and graduate program credit. The remaining 600-level coursework is generally completed over two additional school terms. Two thesis plans are available: (1) normal undergraduate thesis plan, with Bachelor's degree earned upon completion of all undergraduate program requirements; and (2) graduate thesis plan counting for both undergraduate and graduate credit, with Bachelor's and Master's degrees completed concurrently. Contact the Department Head for more information. All majors must take IME-301 (or equivalent course approved by the IME Department Head), as a prerequisite to entry into the program. Additional information about this graduate program can be found in the Graduate Catalog.

## MECHANICAL ENGINEERING (Bachelor of Science)

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**Home Department:** Mechanical Engineering

**Department Head:** Craig J. Hoff, Ph.D.  
Room 2-103 MC, 810-762-7833  
choff@kettering.edu

### Program Overview

The degree program in Mechanical Engineering prepares students for a broad range of careers associated with the design and implementation of mechanical systems involving the conversion, transmission, and utilization of energy. Mechanical engineering courses that provide breadth in the discipline include design, dynamics, engineering materials, thermodynamics, fluid mechanics, heat transfer, vibrations, systems analysis, and associated laboratories. Large and well-equipped laboratories in experimental mechanics, heat transfer, fluid mechanics, engines, vibrations, hydraulics, instrumentation, and automotive emissions support the mechanical engineering program.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a “Specialty” within the Mechanical Engineering program or by pursuing a “Minor” with non-Mechanical Engineering programs. For more details see “Mechanical Engineering Program Specialties” or “Minors”.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a “Specialty” within the ME program or by pursuing a “Minor” with non-ME programs. For more details see “Mechanical Engineering Program Specialties” or “Minors”.

The program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### Program Educational Objectives

The Kettering Mechanical Engineering Program prepares graduates to:

- Provide leadership in contributing to the success of their organizations.
- Work collaboratively to synthesize information and formulate, analyze and solve problems with creative thinking and effective communication.
- Make professional decisions with an understanding of their global, economic, environmental, political and societal implications.
- Apply modern tools and methodologies for problem solving, decision making and/or design.
- Be committed to professional and ethical practices, continuous improvement and life-long learning.

## Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	<u>1</u>
<b>Total</b>		<b>1</b>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to the Humanities	4
LS-489	Senior Seminar: Leadership, Ethics and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
	Advanced Humanities Elective	4
	Advanced Social Science Elective	<u>4</u>
<b>Total</b>		<b>32</b>

### Basic Sciences

CHEM-135/136	Principles of Chemistry/Lab	4
PHYS-114/115	Newtonian Mechanics/Lab	4
PHYS-224/225	Electricity & Magnetism/Lab	4
	Math/Science Elective	<u>4</u>
<b>Total</b>		<b>16</b>

**Mathematics***One from:*

MATH-101	Calculus I	
MATH-101X	Calculus I	4

*And one from:*

MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II Honors	4

*And one from:*

MATH-203	Multivariate Calculus	
MATH-203H	Multivariate Calculus Honors	4

*And one from:*

MATH-204	Differential Equations and Laplace Transforms	
MATH-204H	Differential Equations and Laplace Transforms Honors	4

*And:*

MATH-305	Numerical Methods and Matrices	4
MATH-408	Probability and Statistics	<u>4</u>

**Total** **24****Mechanical Engineering Required Courses**

EE-212	Applied Electrical Circuits	3
MECH-231L	Signals for Mechanical Systems Lab <sup>1</sup>	1
IME-100	Interdisciplinary Design and Manufacturing	4

*One from:*

IME-301	Engineering Materials (or PHYS-342 Materials Science and Nanotechnology if dual degree ME/EP)	4
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*And:*

MECH-100	Engineering Graphical Communication	4
MECH-210	Statics	4
MECH-212	Mechanics of Materials	4
MECH-300	Computer Aided Engineering	4
MECH-310	Dynamics	4
MECH-311	Introduction to Mechanical System Design	4
MECH-312	Mechanical Component Design I	4
MECH-320	Thermodynamics	4
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
MECH-420	Heat Transfer	4
MECH-422	Energy Systems Laboratory	4
MECH-430	Dynamic Systems with Controls	<u>4</u>

**Total** **64****Electives**

Two Free Electives	8
Two Mechanical Engineering Electives	8
Mechanical Engineering Senior Design Project	<u>4</u>

**Total** **20****Culminating Undergraduate Experience***One from:*

CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	<u>4</u>

**Total** **4****(Minimum) Total Credits Required for Program****161**

## Representative Program

Semester	Course #	Course Name	Credits
FR-I	FYE-101	First Year Foundations	1
	CHEM-135	Principles of Chemistry	3
	CHEM-136	Principles of Chemistry Lab	1
	COMM-101	Written & Oral Communication I	4
	MATH-101	Calculus I	4
	MECH-100	Engineering Graphical Communication <sup>2</sup>	<u>4</u>
			17
FR-II	IME-100	Interdisciplinary Design and Manufacturing <sup>2</sup>	4
	MATH-102	Calculus II	4
	PHYS-114	Newtonian Mechanics	3
	PHYS-115	Newtonian Mechanics Lab	1
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			16
SO-I	ECON-201	Economic Principles	4
	MATH-203	Multivariate Calculus	4
	MECH-210	Statics	4
	PHYS-224	Electricity and Magnetism	3
	PHYS-225	Electricity and Magnetism Lab	<u>1</u>
			16
SO-II	EE-212	Applied Electrical Circuits	3
	MECH-231L	Signals for Mechanical Systems Lab	1
	MATH-204	Differential Equations and Laplace Transforms	4
	MECH-212	Mechanics of Materials	4
		Math/Science Elective	<u>4</u>
			16
JR-I	IME-301	Engineering Materials	
	(or PHYS-342)	Materials Science and Nanotechnology if dual degree ME/EP)	4
	MATH-305	Numerical Methods and Matrices	4
	MECH-312	Mechanical Component Design I	4
	MECH-311	Introduction to Mechanical System Design	4
	(HUMN 201 or SSCI 201)	Introduction to the Humanities Introduction to Social Sciences)	<u>4</u>
			20
JR-II	COMM-301	Written & Oral Communication II	4
	MATH-408	Probability and Statistics	4
	MECH-300	Computer Aided Engineering <sup>3</sup>	4
	MECH-310	Dynamics	4
	MECH-320	Thermodynamics	<u>4</u>
			20
SR-I	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	4
		Advanced Humanities or Advanced Social Science Elective	4
		Free Elective	4
		ME Elective <sup>4</sup>	<u>4</u>
			20
SR-II	MECH-420	Heat Transfer	4
	MECH-430	Dynamic Systems with Controls	4
		Advanced Humanities or Advanced Social Science Elective	4
		ME Elective <sup>4</sup>	<u>4</u>
			16

SR-III	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
	MECH-422	Energy Systems Lab	4
		Free Elective	4
		ME Senior Design Project <sup>5</sup>	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4
<b>(Minimum) Total Credits Required for Program</b>			<b><u>161</u></b>

## Mechanical Engineering Program Specialties

Students majoring in Mechanical Engineering may select a specialty consisting of 20 credit hours of courses focused in a particular area. Specialties may include both required and elective courses. First Six Semesters are common to all Mechanical Engineering Students. SR I through SR III representative programs are given for each specialty.

A Mechanical Engineering specialty provides students a depth of study in preparation for a career within an industrial sector and/or as a foundation for graduate study. However, the student's degree is Mechanical Engineering and the selected specialty does not prevent students from working within any industry. The primary advantage is to provide a "jump start" over mechanical engineering graduates from other schools with traditional degree programs. Courses are subject to cancellation due to low enrollment.

### Alternative Energy Specialty

Required courses

- MECH-526 Fuel Cell Science and Engineering
- MECH-527 Energy and the Environment
- MECH-528 Bio and Renewable Energy Laboratory
- MECH-545 Hybrid Electric Vehicle Propulsion

Senior Capstone Design

Select one from the following:

- MECH-521 Energy and Environmental Systems Design
- MECH-529 Design and Modeling of Fuel Cell Systems

### Automotive Engineering Design Specialty

Required Courses

- MECH-548 Vehicle Design Project

Select three from the following:

- MECH-516 Introduction to Finite Element Analysis with Structural Application
- MECH-540 Introduction to Internal Combustion Engines
- MECH-541 Advanced Automotive Power Systems
- MECH-542 Chassis System Design
- MECH-544 Introduction to Automotive Powertrains
- MECH-545 Hybrid Electric Vehicle Propulsion
- MECH-546 Vehicle Systems Dynamics

and select one from the following:

- Any course previously listed
- IME-575 Failure Analysis
- KETT-540 Environmentally Conscious Design and Manufacturing
- MECH-510 Analysis and Design of Machines and Mechanical Assemblies
- MECH-515 Failure and Material Considerations in Design
- MECH-526 Fuel Cell Science and Engineering
- MECH-550 Automotive Bioengineering: Occupant Protection and Safety
- MECH-551 Vehicular Crash Dynamics and Accident Reconstruction
- Other courses with the approval of the automotive faculty

**Bioengineering Application Specialty**

## Required Courses

- MECH-350 Introduction to Bioengineering Applications  
 MECH-554 Bioengineering Applications Project

## Electives

Select three from the following:

- BIOL-141/142 General Biology and Lab  
 BIOL-241/242 Human Biology and Lab  
 BIOL-341 Anatomy and Physiology  
 MECH-550 Automotive Bioengineering: Occupant Protection and Safety  
 MECH-551 Vehicular Crash Dynamics and Accident Reconstruction  
 PHYS-354 Medical Physics

**Machine Design & Advanced Materials Specialty**

## Required Courses

- MECH-412 Mechanical Component Design II  
 MECH-512 Mechanical Systems Design Project  
     **OR** MECH-584/572 Product Design Capstone  
 MECH-516 Introduction to Finite Element Analysis with Structural Applications  
     **OR** MECH-582 Mechanics & Design Simulation with Composite Materials

Electives: Select two from the following:

- IME-474 Design for Manufacture and Assembly  
 IME-575 Failure Analysis  
 MECH-515 Failure and Material Consideration in Design  
 MECH-580 Properties of Polymers

**Bachelor of Science in Mechanical Engineering Curriculum by Specialty****Alternative Energy Specialty – FR I through JR II Representative Program Credit Total: 105**

Semester	Course #	Course Name	Credits
SR-I	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	4
	MECH-420	Heat Transfer	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			16
SR-II	MECH-430	Dynamic Systems with Controls	4
	MECH-527	Energy and the Environment	4
	MECH-528	Bio and Renewable Energy Lab	4
	MECH-545	Hybrid Electric Vehicle Propulsion	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			20
SR-III	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
	MECH-422	Energy Systems Lab	4
	MECH-526	Fuel Cell Science and Engineering	4
		Capstone MECH-521 or MECH-529	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program**

**161**



**Automotive Engineering Design Specialty – FR I through JR II Rep. Program Credit Total: 105**

Semester	Course #	Course Name	Credits
SR-I	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	4
		Advanced Humanities or Advanced Social Science Elective	4
		Automotive Specialty Electives <sup>7-8</sup>	<u>8</u>
			20
SR-II	MECH-420	Heat Transfer	4
	MECH-430	Dynamic Systems with Controls	4
		Advanced Humanities or Advanced Social Science Elective	4
		Automotive Specialty Elective	<u>4</u>
			16
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
	MECH-422	Energy Systems Lab	4
	MECH-548	Vehicle Design Project	4
		Automotive Specialty Elective	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program** **161****Bioengineering Application Specialty – FR I through JR I Representative Program Credit Total: 85**

Semester	Course #	Course Name	Credits
JR-II	COMM-301	Written & Oral Communication II	4
	MECH-300	Computer Aided Engineering	4
	MECH-312	Mechanical Component Design I	4
	MECH-320	Thermodynamics	4
	MECH-350	Introduction to Bioengineering Applications	<u>4</u>
			20
SR-I	MATH-408	Probability and Statistics	4
	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	4
		Advanced Humanities or Advanced Social Science Elective	4
		Bioengineering Specialty Related Elective <sup>7-8</sup>	<u>4</u>
			20
SR-II	MECH-420	Heat Transfer	4
	MECH-430	Dynamic Systems with Controls	4
		Advanced Humanities or Advanced Social Science Elective	4
		Bioengineering Specialty Related Elective <sup>7-8</sup>	<u>4</u>
			16
SR-III	LS-489	Senior Seminar: Leadership, Ethics and Contemp. Issues	4
	MECH-422	Energy Systems Lab	4
	MECH-554	Bioengineering Applications Project	4
		Bioengineering Specialty Related Elective <sup>7-8</sup>	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program** **161**

**Machine Design & Advanced Materials Specialty – FR I through JR II Representative Program Credit Total: 105**

<b>Semester</b>	<b>Course #</b>	<b>Course Name</b>	<b>Credits</b>
SR-I	MECH-322	Fluid Mechanics	4
	MECH-330	Dynamic Systems with Vibrations	4
	MECH-412	Mechanical Component Design II	4
	MECH-516	Intro to Finite Element Analysis w/ Struct App	4
		Advanced Humanities or Advanced Social Science Elective	<u>4</u>
			20
SR-II	MECH-420	Heat Transfer	4
	MECH-430	Dynamic Systems with Controls	4
		Advanced Humanities or Advanced Social Science Elective	4
		Machine Design Specialty Elective <sup>7-8</sup>	<u>4</u>
			16
SR-III	LS-489	Senior Seminar:	
		Leadership, Ethics and Contemp. Issues	4
	MECH-422	Energy Systems Lab	4
	MECH-512	Mechanical Systems Design Project	4
		Machine Design Specialty Elective <sup>7-8</sup>	<u>4</u>
			16
		Culminating Undergraduate Experience	<u>4</u>
			4

**(Minimum) Total Credits Required for Program****161**<sup>1</sup> Students pursuing an Electrical Engineering minor take EE-210/211 in lieu of MECH-231L/EE-212.<sup>2</sup> Approximately one-half of the students take MECH-100 FR-I and IME-100 FR-II, the other one-half take IME-100 FR-I and MECH-100 FR-II.<sup>3</sup> Approximately one-half of students take MECH-300 JR-II and MECH-311 JR-I, the other one-half take MECH-311 JR-II and MECH-300 SR-I.<sup>4</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown. Math/Science electives are any level MATH, BIOL, CHEM, or PHYS course that is not used to complete core degree requirements.<sup>5</sup> ME Senior Design Projects may vary in lecture and/or laboratory credits and terms from those shown.<sup>6</sup> A Mechanical Engineering elective is defined as any 300-599 level BIOL, CE, CHEM, CHME, CS, ECE, EE, IME, ISYS, MATH, MECH or PHYS course that is not used to complete core degree requirements. The following courses also qualify as ME electives: BUSN-372/303, BUSN-373/304, KETT-540, and MGMT-546/BUSN-411.<sup>7</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.<sup>8</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.

## **INNOVATION-TO-ENTREPRENEURSHIP COURSE OF STUDY (i2e-CS)**

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**Home Department:** Multi-disciplinary

**i2e-CS Coordinator:** Dr. Massoud S. Tavakoli, Ph.D., P.E.  
Room 2-131 MC 810-762-7922  
massoud.tavakoli@kettering.edu

### **INNOVATION-TO-ENTREPRENEURSHIP COURSE OF STUDY (i2e-CS)**

The “Innovation-to-Entrepreneurship Course of Study” (i2e-CS) is a critical component of the i2e-Across the University program (i2e-AU) whereby an in-depth, cohesive and contiguous thread of courses will serve as a major curricular component of i2e-AU.

### **i2e-AU VISION**

Kettering graduates will know that they can *change the world* because they are equipped with a compelling combination of:

- strong technical skills,
- tested work ethic, and
- agile entrepreneurial mindset.

### **i2e-AU MISSION**

To provide Kettering students with a combination of curricular, co-curricular and extra-curricular pathways for developing and practicing an innovation and entrepreneurial mindset that is valuable for diverse careers in large corporations, high-risk start-ups and social enterprises.

### **PROGRAM GOALS AND OVERVIEW**

Innovation-to-Entrepreneurship Course of Study (i2e-CS) is an 18-credit elective sequence developed to ensure that students receive, in an immersion style, academic and practical exposure to innovation and entrepreneurship mindset. This course of study is designed based on the following fundamental principles:

- Hybrid curricular, co-curricular and extra-curricular pathways
- Exposure in every school term
- Development & practice of entre/intrapreneurship mindset
- Multi-disciplinary synergy
- Faculty coaching & peer-to-peer mentorship
- Course credit for students
- Recognition for students

The sequencing of the courses progresses from exposure to innovation activities (e.g. engineering design and applied science) in the Freshman year to an inquisitive exploration of the mindset and activities of successful and failed innovators and entrepreneurs in the Sophomore year. Meanwhile, the students are gradually encouraged and shown ways of recognizing opportunities and developing innovative ideas. In combination with peer-to-peer networking (through KES) and faculty mentorship, the students will continue to develop their innovation ideas through the Junior year while developing the broader mindset of intrapreneurship and venture development. This course of study will also provide a strong linkage for project ideas gathered/sponsored through the Center for Culminating Undergraduate Experience (CCUE). During the Senior year, the students will engage in skunkworks and prototyping activities with an eye on developing business models and commercialization pathways (or intra-corporate acceptance pathways) for their innovative ideas and/or products. The i2e-Creativity Lab (T-Space) will be available to support these activities.

## PRE-MED EDUCATION COURSE OF STUDY

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**Home Department:** Chemistry and Biochemistry

**Pre-Med Coordinator:** Stacy Seeley, Ph.D.  
Room 3-103 MC 810-762-9561  
sseeley@kettering.edu

### PRE-MED EDUCATION COURSE OF STUDY

It's all about options and increasing your opportunities to be successful. Getting an engineering or science undergraduate degree can be taken to the next level with a Pre-Med Course of Study. This is ideal for students who are considering medical school, a job in the growing Biotechnical industry, or continuing their education in graduate school. Medicine is becoming an increasingly technical field; an engineering or science degree and the Pre-Med Course of Study can prepare you to be a great doctor, medical researcher, or designer of tomorrow's lifesaving technologies.

Two of Kettering's programs already include the specific courses required for entrance into most medical schools: Biochemistry and Chemistry. Students in any of the other degree programs can obtain the required courses by completing the Biochemistry minor, a year of Physics, and a year of Biology to obtain the most common Medical School prerequisites which are as follows:

- One year of General Chemistry: CHEM-135/136 or CHEM-137/136, CHEM-237/238  
Students may take General Chemistry I, CHEM-137 and CHEM-136, Principles of Chemistry Lab or CHEM-135/136 for their first term of chemistry. Principles of Chemistry, CHEM-135/136 is already part of the typical Engineering curricula. A second term of General Chemistry must be taken (i.e. CHEM-237/238).
- One year of Organic Chemistry: CHEM-345/346, CHEM-347/348  
Industrial Organic Chemistry which is included in the Engineering curricula is not considered sufficient for most Medical Schools. Two terms of Organic Chemistry (i.e. CHEM-345/346 and CHEM-347/348) must be taken.
- One year of Biology: BIOL-141/142, BIOL-241/242  
Students must take General Biology Lecture + Lab and Human Biology Lecture + Lab.
- One-half year of Biochemistry: CHEM-351/352  
The two Organic Chemistry and one Biochemistry courses comprise the Biochemistry Minor. As such, students completing the Premedical Education Course of Study will earn a Biochemistry Minor which will be listed on their transcript. The Premedical Education Course of Study will not appear on the transcript.
- One year of Physics: PHYS-114/115, PHYS-224/225

Other requirements for most medical schools, such as one year of college math and courses in liberal studies, are already included within all the degree programs. Students can typically utilize free or technical electives to take a portion of the credits in the Pre-Med Course of Study. For a sample curriculum for your degree program that incorporates the pre-med course of study, see your degree program department chair or Dr. Stacy K. Seeley (pre-med coordinator). In addition to the Pre-Med Course of Study, Engineering students are typically required to take a Senior Capstone Course (sometimes referred to as a Senior Project Course) to complete their Major Degree course requirements. The typical Engineering student pursuing the Pre-Med Course of Study will require more credits (~8 credits) than a given Engineering Program—refer to your department degree program requirements for complete details. The typical Medical School does not usually require other courses (e.g. Anatomy & Physiology or Psychology). However, students planning on applying to specific medical schools must consult the given medical school for further details.

## MINORS

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A minor is an area of concentrated study, typically outside of the major area of study. A minor requires a minimum of four classes (16 credits) in a directed area of study. Minors may require coursework beyond the minimum of 41 classes (161 credits) required for completion of the major. Coursework taken outside of Kettering University is not transferable towards a minor. Minors are not required for graduation though a student may elect to pursue a minor in an area of additional interest. Minors appear on a student's transcript at student declaration, and requirements must be completed at the time of graduation. The Academic Department granting the minor provides an audit for each student who applies to graduate.

### Acoustics (Physics Department)

**Total Required Credits: 16**

**Required Courses:**

PHYS-302      Vibration, Sound, and Light  
 PHYS-388      Acoustics in the Human Environment  
 EP-485        Acoustic Testing and Modeling

**Plus one from the following:**

EE-434        Digital Signal Processing  
 MECH-330     Dynamic Systems with Vibrations

For more information on the Acoustics Minor contact Dr. Dan Ludwigsen at [dludwigs@kettering.edu](mailto:dludwigs@kettering.edu), or send an email to [physics@kettering.edu](mailto:physics@kettering.edu).

### Applied and Computational Mathematics (Mathematics Department)

**Total Required Credits: 32**

**Required Courses:**

MATH-101      Calculus I  
 MATH-102      Calculus II  
 MATH-203      Multivariate Calculus  
 MATH-204      Differential Equations and Laplace Transform  
 MATH-305      Numerical Methods and Matrices

**Plus three mathematics courses including any two from the following:**

MATH-308      Abstract Algebra  
 MATH-313      Boundary Value Problems  
 MATH-321      Real Analysis I  
 MATH-327      Mathematical Statistics I  
 MATH-408      Probability and Statistics  
 MATH-416      Vector Analysis  
 MATH-418      Intermediate Differential Equations

For more information on the Applied and Computational Mathematics Minor contact Dr. Ilya Kudish at [ikudish@kettering.edu](mailto:ikudish@kettering.edu) or 810-762-7431) or Dr. Leszek Gawarecki at [lgawarec@kettering.edu](mailto:lgawarec@kettering.edu) or 810-762-9557.

### Applied Optics (Physics Department)

**Total Required Credits: 16**

**Required Courses:**

PHYS-302      Vibration, Sound, and Light  
 PHYS-376      Photonics and Optoelectronics  
 PHYS-378      Spectroscopy and Microscopy  
 PHYS-477      Optics and Lab

Students interested in the Applied Optics Minor may contact Dr. Kathryn Svinarich at [ksvinari@kettering.edu](mailto:ksvinari@kettering.edu) or 810-762-7471, or send an email to [physics@kettering.edu](mailto:physics@kettering.edu).

## Biochemistry (Chemistry/Biochemistry Department)

**Total Required Credits: 26**

**Required Courses:**

CHEM-135/136	Principles of Chemistry/Lab (4) or CHEM-137/136 General Chemistry I/Lab (4)
CHEM-237/238	General Chemistry II/Lab (4)
CHEM-345/346	Organic Chemistry I/Lab (6)
CHEM-347/348	Organic Chemistry II/Lab (6)
CHEM-351/352	Biochemistry I/Lab (6)

For more information on the Biochemistry Minor contact Dr. Stacy Seeley at [sseeley@kettering.edu](mailto:sseeley@kettering.edu) or 810-762-9561.

## Bioinformatics (Computer Science Department)

**Total Required Credits: 38**

**Required Courses:**

BINF-310	Introduction to Bioinformatics
BIOL-241/242	Human Biology/Lab:
BIOL-381/382	Molecular Biology/Lab
BIOL-481	Genetics
CHEM 135	Principles of Chemistry OR CHEM-137 General Chemistry I
CHEM-136	Principles of Chemistry Lab
CHEM-247	Survey of Organic Chemistry
CS-101	Computing and Algorithms I
CS-102	Computing and Algorithms II
CS-465	Information Retrieval and Data Mining

## Biology (Chemistry/Biochemistry Department)

**Total Required Credits: 20**

**Required Courses:**

BIOL-141/142	General Biology/Lab (4)
BIOL-241/242	Human Biology/Lab (4)

**Plus 12 credits of 300-level and above Biology Courses that are beyond what is required in the major. These courses may include:**

BIOL-311	Ecology (4)
BIOL-321	Biological Techniques I (4)
BIOL-331	Biological Techniques II (4)
BIOL-341	Anatomy and Physiology (4)
BIOL-361/362	Microbiology/Lab (6)
BIOL-381/382	Molecular Biology/Lab (6)
BIOL-441/442	Cellular Biology/Lab (6)
BIOL-481	Genetics (4)
BIOL-491	Advanced Topics in Biology/Lab (6)

For more information on the Biology Minor contact Dr. Stacy Seeley at [sseeley@kettering.edu](mailto:sseeley@kettering.edu) or 810-762-9561.

## Business (Business Department)

**Total Required Credits: 32**

**Required Courses:**

ECON-201	Economic Concepts
Economics Elective 300 or higher	

*And one from:*

MATH-408	Probability and Statistics
MATH-310	Biostatistics

MATH-327	Mathematical Statistics I
<i>And:</i>	
BUSN-211	Management Concepts
BUSN-222	Managerial Accounting
<i>And one from:</i>	
BUSN-331	Financial Management
BUSN-332	Financial Markets
<i>And:</i>	
BUSN-341	Introduction to Marketing
<i>And one from:</i>	
BUSN-152	Information Systems
BUSN-303	New Venture Creation: Entrepreneurship
BUSN-304	Intrapreneurship and Innovation Development
BUSN-411	Project Management

For more information on the Business Minor contact the Department of Business at 810-762-7952.

## Chemistry (Chemistry/Biochemistry Department)

**Total Required Credits: 26**

### Required Courses:

CHEM-135/136	Principles of Chemistry/Lab (4) or CHEM-137/136 General Chemistry I/Lab (4)
CHEM-237/238	General Chemistry II/Lab (4)
CHEM-345/346	Organic Chemistry I/Lab (6)
CHEM-347/348	Organic Chemistry II/Lab (6)

**Plus 6 credits of 300-level and above Chemistry Courses that are beyond what is required in the major. These courses may include:**

CHEM-361/362	Physical Chemistry I/Lab (6)
CHEM-363/364	Physical Chemistry II/Lab (6)
CHEM-373/374	Analytical Chemistry/Lab (6)
CHEM-437/438	Advanced Inorganic Chemistry/Lab (6)
CHEM-451/452	Biochemistry II/Lab (6)
CHEM-461/462	Colloid Science/Lab (6)
CHEM-477/478	Advanced Organic Chemistry/Lab (6)
CHEM-491	Advanced Chemistry Elective/Lab (6)

For more information on the Chemistry Minor contact Dr. Stacy Seeley at [sseeley@kettering.edu](mailto:sseeley@kettering.edu) or 810-762-9561.

## Computer Engineering (Electrical and Computer Engineering Department)

**Total Required Credits: 36**

### Required Courses:

CE-210	Digital Systems I
CE-320	Microcomputers I
CS-101	Computing and Algorithms I
CS-102	Computing and Algorithms II
EE-210	Circuits I
EE-211	Circuits I Lab
EE-320	Electronics I
EE-321	Electronics I Lab

**Plus one from the following:**

CE-412	Digital Systems II
CE-422	Computer Architecture and Organization

**Plus one from the following:**

CE-420	Microcomputers II
CE-426	Real-Time Embedded Computers

**Plus one from the following:**

CE-480	Computer Networks
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**CS-451            Operating Systems**

For more information on the Computer Engineering Minor contact Dr. James McDonald at [mcdonald@kettering.edu](mailto:mcdonald@kettering.edu) or 810-762-9701.

**Computer Gaming (Computer Science Department)**

**Total Required Credits: 20**

**Required Courses:**

CS-101	Computing and Algorithms I
CS-102	Computing and Algorithms II
CS-320	Computer Graphics
CS-385	Introduction to Game Design
CS-485	Advanced Game Development

For more information on the Computer Gaming Minor contact Dr. John Geske at [jgeske@kettering.edu](mailto:jgeske@kettering.edu) or 810-762-7963.

**Computer Science (Computer Science Department)**

**Total Required Credits: 24**

**Required Courses:**

CS-101	Computing and Algorithms I
CS-102	Computing and Algorithms II
CS-203	Computing and Algorithms III
CS-211	Discrete Mathematics

**Plus two additional Computer Science courses numbered 300 or above**

For more information on the Computer Science Minor contact Dr. John Geske at [jgeske@kettering.edu](mailto:jgeske@kettering.edu) or 810-762-7963.

**Economics (Liberal Studies Department)**

**Total Required Credits: 16**

**Required Courses:**

Select four from the following:

ECON-342	Intermediate Microeconomics; Managerial Economics
ECON-344	Intermediate Macroeconomics: Economic Growth and Fluctuation
ECON-346	Introduction to Econometrics
ECON-348	History of Economic Thought
ECON-350	Comparative Economic Systems
ECON-352	International Economics
ECON-391	Topics in Economics
ECON-499	Economics Independent Study
HIST-322	Africa in the World Economy

For more information on the Economics Minor contact Dr. Karen Wilkinson at [kwilkins@kettering.edu](mailto:kwilkins@kettering.edu) or 810-762-7827.

**Electrical Engineering (Electrical and Computer Engineering Department)**

**Total Required Credits: 32**

**Required Courses:**

CE-210	Digital Systems I
EE-210	Circuits I
EE-211	Circuits I Lab
EE-240	Electromagnetic Fields and Applications
EE-310	Circuits II
EE-320	Electronics I



EE-321	Electronics I Lab
<b>Plus three from the following:</b>	
EE-340	Electromagnetic Wave Propagation
EE-342	Electrical Machines
EE-344	Fundamentals of Power Systems
EE-346	High Voltage Generation and Measurement Techniques
EE-348	Electromagnetic Compatibility
EE-420	Electronics II
EE-424	Power Electronics and Applications
EE-427	Semiconductor Device Fundamentals
EE-430	Communication Systems
EE-432	Feedback Control Systems
EE-434	Digital Signal Processing
EE-444	Computational Methods in Power Systems
EE-524	Fuel Cell System Integration and Packaging
EE-530	Digital Control Systems
EE-582	Robot Dynamics and Control

For more information on the Electrical Engineering Minor contact Dr. James McDonald at [mcdonald@kettering.edu](mailto:mcdonald@kettering.edu) or 810-762-9701.

## History (Liberal Studies Department)

**Total Required Credits: 16**

**Required Courses (four from the following):**

HIST-306	International Relations
HIST-308	America and the World
HIST-310	Imperialism
HIST-312	History of Science
HIST-314	Human Conflict & Conflict Resolution
HIST-316	History of the Atlantic World
HIST-320	Modern Middle East
HIST-322	Africa in the World Economy
HIST-391	Topics in History
HIST-499	History Independent Study

For more information on the History Minor contact Dr. Karen Wilkinson at [kwilkins@kettering.edu](mailto:kwilkins@kettering.edu) or 810-762-7827.

## Innovation and Entrepreneurship (Business Department)

**Total Required Credits: 28**

**Required Courses:**

ECON-201	Economic Concepts
Economics Elective 300 or higher	

*And one from:*

MATH-408	Probability and Statistics
MATH-310	Biostatistics
MATH-327	Mathematical Statistics I

*And:*

BUSN-303	New Venture Creation: Entrepreneurship
BUSN-304	Intrapreneurship and Innovation Development

*And two from:*

BUSN-211	Management Concepts
BUSN-222	Managerial Accounting
BUSN-331 or 332	Financial Management or Financial Markets
BUSN-341	Introduction to Marketing
BUSN-402	Business Law

For more information on the Business Minor contact the Department of Business at 810-762-7952.

## International Studies (Liberal Studies Department)

**Total Required Credits: 16**

### Required Courses (four from the following):

The International Studies Minor consists of four of the following courses; no more than two from the same discipline within the department of Liberal Studies (e.g. history) may count toward the minor. No more than one course required for one's major may count toward the minor.

BUSN-451	International Business
ECON-350	Comparative Economic Systems
ECON-352	International Economics
HIST-306	International Relations
HIST-308	America and the World
HIST-310	Imperialism
HIST-314	Human Conflict and Conflict Resolution
HIST-316	History of the Atlantic World
HIST-320	Modern Middle East
HIST-322	Africa in the World Economy
HIST-391	Topics in History (must have international focus)
HUMN-362	Global Film Cultures
HUMN-364	Bollywood Film
HUMN-391	Topics in Humanities (must have international focus)
HUMN-499	Humanities Independent Study (must have international focus)
LIT-309	The Literature of Multicultural America
LIT-311	Literatures of the African Diaspora
LIT-319	Indians, Aliens, and Others: Cross-Cultural Encounters in Literature
LIT-391	Topics in Literature (must have international focus)
SOC-332	Contemporary Social Problems
SOC-336	Sociology of the Family
SOC-337	Religion in Society
SOC-391	Topics in Sociology (must have international focus)
SSCI-314	Technology and Sustainable Development
SSCI-391	Topics in Social Sciences (must have international focus)
SSCI-398	Social Science course in a Study Abroad program
SSCI-499	Social Science Independent Study (must have international focus)

"Topics" courses in the humanities and social sciences (numbered 391) may also count for this minor. See the *Quick Guide to Liberal Studies Electives* distributed at registration for the minors these courses support.

For more information on the International Studies Minor contact Dr. Karen Wilkinson at [kwilkins@kettering.edu](mailto:kwilkins@kettering.edu) or 810-762-7827.

## Literature (Liberal Studies Department)

**Total Required Credits: 16**

### Required Courses (four from the following):

HUMN-365	Art & Nature in Early Industrial England
HUMN-391	Topics in Humanities (must have literature focus)
HUMN-499	Humanities Independent Study (must have literature focus)
LIT-304	American Literature and Philosophy
LIT-307	Poetry: Substance and Structure
LIT-309	The Literature of Multicultural America
LIT-310	African American Literature
LIT-311	Literatures of the African Diaspora
LIT-315	Literature of the Fantastic
LIT-317	Masterpieces of Drama
LIT-319	Indians, Aliens, and Others: Cross-Cultural Encounters in Literature
LIT-351	Literature in a Foreign Language
LIT-372	Masterpieces of Literature
LIT-374	Seminar on J.R.R. Tolkien
LIT-379	The Plays of Shakespeare
LIT-391	Topics in Literature

For more information on the Literature Minor contact Dr. Karen Wilkinson at [kwilkins@kettering.edu](mailto:kwilkins@kettering.edu) or 810-762-7827.

## Manufacturing Engineering (Industrial and Manufacturing Engineering Department)

**Total Required Credits: 24**

**Required Courses:**

IME-301	Engineering Materials
IME-403	Computer Numerical Control Machining
IME-409	Computer Integrated Manufacturing

**Plus three from the following:**

IME-404	Sheet Metal Forming
IME-405	Casting Processes
IME-408	Robotics in Automation
IME-474	Design for Manufacture and Assembly
IME-499	Independent Study (must be pre-approved by IME Department Head for use in minor)
IME-507	Polymer Processing
IME-575	Failure Analysis
KETT-540	Environmentally Conscious Design and Manufacturing

For more information on the Manufacturing Engineering Minor contact Dr. W.L. Scheller at [wschelle@kettering.edu](mailto:wschelle@kettering.edu) or 810-762-7974.

## Materials Science (Physics Department)

**Total Required Credits: 16**

**Required Courses:**

PHYS-342	Materials Science and Nanotechnology
PHYS-362	Modern Physics and Lab
PHYS-376	Photonics and Optoelectronic or PHYS-446 Solid State Physics (PHYS-446 is required for the concentration)

**Plus one from the following:**

CHEM-345/346	Organic Chemistry I / Lab
CHEM-361/362	Physical Chemistry I/Lab
CHEM-373/374	Analytical Chemistry/Lab
EE-325	Principles of Microelectronics Processing
EE-427	Semiconductor Device Fundamentals

For more information on the Materials Science Minor contact Dr. Prem Vaishnava at [pvaishna@kettering.edu](mailto:pvaishna@kettering.edu) or 810-762 -7933 or send an email to [physics@kettering.edu](mailto:physics@kettering.edu).

## Medical Physics (Physics Department)

**Total Required Credits: 16**

**Required Courses:**

PHYS-354	Medical Physics Principles
PHYS-362	Modern Physics and Lab
PHYS-464	Nuclear Physics: Principles and Applications

**Plus one from the following:**

BIOL-241/242	Human Biology and Lab
EE-332	Signals and Systems
MECH-350	Introduction to Bioengineering Applications
PHYS-378	Spectroscopy and Microscopy

For more information on the Medical Physics Minor contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).

## Physics (Physics Department)

**Total Required Credits: 16**

**Required Courses:**

PHYS-302 Vibration, Sound and Light

PHYS-362 Modern Physics

**Plus two from the following:**

PHYS-412 Theoretical Mechanics

PHYS-446 Solid State Physics

PHYS-452 Thermodynamics and Statistical Physics

PHYS-462 Quantum Mechanics

PHYS-464 Nuclear Physics: Principles and Applications

For more information on the Physics Minor contact the Physics Department Head at [physics@kettering.edu](mailto:physics@kettering.edu).

## Pre-Law (Liberal Studies Department)

**Total Required Credits: 16**

The Liberal Studies minor in Pre-law allows students to take courses related to four learning objectives that are described below. Students select four courses representing at least three of these objectives. Select courses from at least two different disciplines across these objectives. The disciplines include history, philosophy, literature, sociology and communication. "Topics" courses (e.g. SOC-391) may also apply.

1. Achieve an understanding of international institutions and issues, of world events, and of the increasing interdependence of the nations and communities of the world.

HIST-306 International Relations

HIST-308 America and the World

HIST-310 Imperialism

HIST-316 History of the Atlantic World

HIST-320 Modern Middle East

HIST-322 Africa in the World Economy

2. Achieve an understanding of 1) the development of political thought and/or 2) political and legal systems.

LIT-304 American Literature and Philosophy

PHIL-373 Philosophy

PHIL-378 Moral and Ethical Philosophy

3. Achieve an understanding of human behavior and social interaction with particular emphasis on understanding diverse cultures within and beyond the U.S

HUMN-362 Global Film Cultures

HUMN-365 Art & Nature in Early Industrial England

LIT-309 The Literature of Multicultural America

LIT-310 African American Literature

LIT-311 Literatures of the African Diaspora

LIT-319 Indians, Aliens, and Others: Cross-Cultural Encounters in Literature

SOC-332 Contemporary Social Problems

SOC-336 Sociology of the Family

SOC-337 Religion in Society

SOC-338 Gender and Society

SSCI-314 Technology and Sustainable Development

SSCI-398 Social Science Course in Study Abroad Program

4. Achieve an understanding of effective and ineffective practices in human communication.

COMM-311 Rhetorical Principles of Persuasion

COMM-313 Rhetorical Principles of Public Speaking

HIST-314 Human Conflict and Conflict Resolution

SOC-335 Analysis of Social Dissent

“Topics” courses in the humanities and social sciences (numbered 391) may also count for this minor. See the *Quick Guide to Liberal Studies Electives* distributed at registration for more information.

For more information on the Pre-Law Minor contact Dr. Karen Wilkinson at [kwilkins@kettering.edu](mailto:kwilkins@kettering.edu) or 810-762-7827.

## Statistics (Mathematics Department)

**Total Required Credits: 36**

### Required Courses:

IME-332	Engineering Statistics II: Statistical Inference and Regression
IME-333	Engineering Statistics III: Design of Experiments
MATH-101	Calculus I
MATH-102	Calculus II
MATH-203	Multivariate Calculus
MATH-310	Biostatistics I
MATH-327	Mathematical Statistics I

### Plus two from the following:

IME-422	Systems Modeling II: Simulation
IME-471	Quality Systems I: Quality Assurance
IME-572	Maintainability & Reliability
MATH-427	Mathematical Statistics II
MATH-428	Sampling Theory

For more information on the Statistics Minor contact Dr. Leszek Gawarecki at [lgawarec@kettering.edu](mailto:lgawarec@kettering.edu) or 810-762-9557.

## System and Data Security (Computer Science Department)

**Total Required Credits: 20**

### Required Courses:

CS-101	Computing and Algorithms I
CS-102	Computing and Algorithms II

### Plus three from the following:

CS-415	Cryptography
CS-455	Computer and Network Security
CS-458	Computer and Network Forensics
CS-459	Secure Software

For more information on the System and Data Security Minor contact Dr. John Geske at [jgeske@kettering.edu](mailto:jgeske@kettering.edu) or 810-762-7963.

## COURSE DESCRIPTIONS

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This section lists updated descriptions for all university courses; the descriptions appear in alphabetical order according to their course letter designations. These descriptions include any prerequisites (requirements student must satisfy before registering for the course), corequisites (requirements students must satisfy while taking the course), the number of credit hours applied for each course, and, where relevant, the hours devoted to lecture, recitation, and laboratory (see applicable department sections for the total credits required for each major or program). If no indication exists for lecture, discussion and laboratory hours, then the course is considered a lecture.

Students should be aware that the courses listed here are subject to change. Many courses are regularly offered in the fall, while others are offered in the winter or summer. However, semester enrollment, course demand, changes in faculty and other factors will sometimes affect the offering of courses. In addition, new courses may have been added and changes in existing courses may have occurred since the printing of this bulletin.

When planning a semester program, students should search the Banner web for information regarding course offerings.

Many of the 500-level courses listed here can apply to undergraduate or graduate credit. Contact the individual degree department or Graduate Studies Office for more information.

The course numbers 191, 291, 391, 491, and 591 shall be used to describe special topics courses at introductory, intermediate, advanced, and mezzanine levels, respectively. Special topics courses are one-time offerings whose content is determined by current faculty interest. These courses may be repeated for credit when the course is run with different contents.

The course numbers 297 and 497 shall be used to admit credit for transfer or guest courses that are not equivalent to existing Kettering courses within a discipline. The subject FREE and course numbers 297 and 497 are used to admit transfer or guest courses that are not equivalent to Kettering courses and do not fall within existing Kettering disciplines. These course numbers are not used for study abroad transfer credit.

The course numbers 398, 498, and 598 shall be used to describe transfer courses taken as part of a Kettering University International Studies Program.

The course numbers 499 and 599 shall be used to describe an independent study course. Independent study is student-directed exploration with faculty guidance at an advanced level. This course may be repeated for credit when the course is run with different content.

This set of numbers indicates hours per week & credit hours:

class	other	lab	credit hours
4	0	0	(4)

"Other" may refer to recitation hours or project time.

↓  
**400(4)**

### SAMPLE COURSE DESCRIPTION

#### **BIOL-441 Molecular and Cellular Biology**

Prerequisites: BIOL-241, BIOL-242

Corequisites: BIOL-442

Minimum Class Standing: JRI

This course covers the basic theory and methodology in Molecular and Cellular Biology. The topics covered include the relationship between molecular structure and function, the dynamic character of cellular organelles, the use of chemical energy in running cellular activities, and the mechanisms that regulate cellular activities. Terms Offered: As Needed

*Course availability is subject to change due to low enrollment, or faculty availability.*

**ACCT-212 Managerial Accounting****400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course focuses on the use of financial information in the making of managerial decisions. Subject areas included are the development of manufacturing costs and their control, budgeting, performance analysis, cost-profit-volume analysis, relevant costs, time value of money techniques, and capital budgeting.

**ACCT-313 Cost Accounting****400(4)**

Prerequisites: ACCT-212

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

This course is designed for students who expect to be using cost information. Units of study include the nature and behavior of production costs, cost cycle, overhead and overhead rates, absorption costing, cost standards, variance analysis and reporting for cost control. Emphasis is placed on the nature of cost concepts and reports as they relate to management objectives.

**ACCT-411 Intermediate Accounting****400(4)**

Prerequisites: ACCT-210, ACCT-212

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

Theory, the conceptual framework, and development of generally accepted accounting principles are discussed in this course. Measurement, valuation, and reporting concepts and procedures underlying the assets, liabilities, owners' equity, revenues, and expenses contained in financial statements are examined. The analysis, interpretation, and use of financial statements are also explored.

**ART-305 Art: Styles and Aesthetics****400(4)**

Prerequisites: COMM-101, HUMN-201, SSCT-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A presentation of art emphasizing significant periods of stylistic and aesthetic developments in human creative experience. Particular topics, periods and styles may vary from term to term.

**BINF-310 Introduction to Bioinformatics****400(4)**

Prerequisites: BIOL-241, BIOL-242, CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Bioinformatics will introduce students to the analysis of genetic sequences. Genetic information derived from the human genome project and other model systems will be presented. Lectures will discuss basic algorithmic techniques using available computational tools for extracting biological information from nucleotide and protein sequences. Bioinformatics software will be used to demonstrate how to manage, search and analyze genetic sequences.

**BINF-490 Bioinformatics Capstone****400(4)**

Prerequisites: BINF-310, CHEM-351, CHEM-352, CS-465

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Needed

This course involves a comprehensive design experience focusing on a project in computational biology. As part of the course, students will work in groups to design, build, implement, and test software packages to solve relevant computational problems in biological systems.

**BIOL-141 General Biology****310(3)**

Prerequisites: None

Corequisites: BIOL-142

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course serves as a general biology course. It will cover topics including basic biochemistry, cells, cell division, classification of organisms, populations, communities, and biomes. The life cycles and biology of single-cell and multicellular organisms will also be covered.

**BIOL-142 General Biology Lab****002(1)**

Prerequisites: None

Corequisites: BIOL-141

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course serves as a general biology laboratory. It will provide hands-on experience with areas of basic biology including basic biochemistry, cells, cell division, classification of organisms, populations, communities, biomes, and single-cell and multicellular organisms.

**BIOL-241 Human Biology****310(3)**

Prerequisites: CHEM-135/136 or CHEM-137/136

Corequisites: BIOL-242

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

This course serves as the second general biology course and focuses on humans. It will cover topics including basic biochemistry, cells, cell division, the organization and regulation of biological systems, human genetics and chromosomal inheritance, biotechnology, and various human organ systems.

**BIOL-242 Human Biology Lab****002(1)**

Prerequisites: CHEM-135/136 or CHEM-137/136

Corequisites: BIOL-241

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

This course serves as the second general biology laboratory. It will cover topics including basic biochemistry, cells, cell division, the organization and regulation of biological systems, human genetics and chromosomal inheritance, biotechnology, and various human organ systems.

**BIOL-311 Ecology****400(4)**

Prerequisites: BIOL-141 or Permission of Instructor

Corequisites: None

Minimum Class Standing: none

Terms Offered: Summer, Fall

This course is an introductory ecology course that will examine human interactions and the resulting effects of these actions on plant communities, animal communities, and the physical environment. Areas such as water, energy, agriculture, industry, recreation, and demographics are considered. Emphasis will be placed on conservation, pollution, energy, and other contemporary concerns.

**BIOL-321 Biological Techniques I****103(4)**

Prerequisites: BIOL-241 or Permission of Instructor

Corequisites: None

Minimum Class Standing: none

Terms Offered: Summer, Fall

This course is an introductory laboratory course that will cover some of the most widely used experimental procedures used in the biological and biotechnological fields. Basic laboratory techniques, sterile technique, electrophoretic techniques, nucleic acid isolation, manipulation, amplification, and cloning will be covered. You will also gain familiarity with types of equipment frequently used in the biological laboratory.

**BIOL-331 Biological Techniques II****103(4)**

Prerequisites: BIOL-321 or Permission of Instructor

Corequisites: None

Minimum Class Standing: none

Terms Offered: Winter, Spring

This course is the second of the introductory laboratory courses that will cover some of the most widely used experimental procedures used in the biological and biotechnological fields. Basic equipment/instrumentation, laboratory techniques, and sterile techniques will be reviewed. Protein/enzyme assays, purification, and analysis will be covered in detail. The student will also gain familiarity with the design of experiments.

**BIOL-341 Anatomy & Physiology****400(4)**

Prerequisites: BIOL-241/242 or MECH-350, or Permission of Instructor

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This course serves as an introduction to Human Anatomy and Physiology, It will cover topics including the organization and regulation of biological tissues, organs and organ systems as well as human development.

**BIOL-361 Microbiology****400(4)**

Prerequisites: BIOL-282

Corequisites: BIOL-362

Minimum Class Standing: none

Terms Offered: Summer, Fall –as needed

This is an introductory microbiology course. It will comprise topics including microbial cell structure and function, metabolism, growth and regulation, diversity, genetics, host-microbe interactions, disease and microbial ecology. This course will cover viruses, archaea, fungi, and protists but the main focus of the course will be on bacteria.

**BIOL-362 Microbiology Lab****004(2)**

Prerequisites: BIOL-282

Corequisites: BIOL-361

Minimum Class Standing: none

Terms Offered: Summer, Fall –as needed

This laboratory course covers a number of microbiological procedures and topics. This includes microbial cultivation, isolation, and identification utilizing sterile technique. This course will cover microbial pathogenesis, sensitivity to antimicrobial agents, immunity, and the interaction of microbes with their environment.



**BIOL-381 Molecular Biology****400(4)**

Prerequisites: BIOL-241/242 or BIOL-282

Corequisites: BIOL-382

Minimum Class Standing: none

Terms Offered: Summer, Fall –as needed

This course covers the basic theory and methodology of Molecular Biology. Concepts to be examined include how biological structure determines function, mechanisms and regulation of replication, transcription, and translation, processing of mRNA transcripts and proteins, and mechanisms underlying basic cellular activities.

**BIOL-382 Molecular Biology Lab****004(2)**

Prerequisites: BIOL-241/242 or BIOL-282

Corequisites: BIOL-381

Minimum Class Standing: none

Terms Offered: Summer, Fall –as needed

This laboratory course serves as an introduction to methods utilized to study molecular biology. Laboratory techniques will include molecular cloning, RNA isolation, extraction, purification, and quantification, site-directed mutagenesis, and data interpretation. The course is designed for the junior level and is meant to be taken simultaneously with BIOL 381.

**BIOL-441 Cellular Biology****400(4)**

Prerequisites: BIOL-281 or CHEM-351

Corequisites: BIOL-442

Minimum Class Standing: none

Terms Offered: Summer, Fall - As Needed

This course serves as an introduction to the structure and function of cells. Topics include cell motility, intracellular transport, cellular chemistry, membranes, organelles, metabolism, reproduction, and signaling.

**BIOL-442 Cellular Biology Lab****004(2)**

Prerequisites: BIOL-281 or CHEM-351

Corequisites: BIOL-441

Minimum Class Standing: none

Terms Offered: Summer/Fall, As Needed

This laboratory course serves as an introduction to methods utilized to study cell biology and physiology. Laboratory techniques will include microscopy, yeast transformation, cellular assays (luminescence or ELISA), cell fractionation, Western Blotting, tissue culture, DNA transfection, and assays specific to assessment of drug activity or induction of chemical pathways. The course is designed for the senior level and is meant to be taken simultaneously with BIOL 441.

**BIOL-481 Genetics****400(4)**

Prerequisites: BIOL-241, BIOL-242

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course serves as an introduction in the study of inheritance in all of its manifestations. Specifically, it introduces theory and problem solving in the three areas of Genetics: Classical Genetics, Molecular Genetics, and Population Genetics. Topics include Mendelian Genetics, sex-linkage and pedigree analysis, non-Mendelian patterns of inheritance, the molecular basis of inheritance and gene expression, the theory of methodology of modern DNA technologies, and population genetics and evolution.

**BIOL-494 Senior Research/Seminar****006(2)**

Prerequisites: BIOL-381, BIOL-382

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A capstone course where students design, execute, analyze and report the results of original research in collaboration with a faculty member. Students are required to give a formal presentation of their findings.

**BUSN-101 Business Decision Making****400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course enables students to develop basic skills in problem solving, creativity, leadership, and project skills. Methods applied include lecture, individual and group projects, and games. The course builds skills in the areas previously listed.

**BUSN-102 Introduction to Business Methods****400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course is designed to introduce students to a quantitative approach to common business methods used to plan and manage a successful business. Units of study include the dynamic nature of business in relation to economic systems, ethics and social responsibility, and the legal and regulatory environment of business. Focused study will include the necessary decisions used in developing a strategic and operational plans,

managing people, technology, the business enterprise, marketing research and planning, sales implementation, accounting and financial statements, finance and international business.

### **BUSN-152 Information Systems**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course explores how organizations use information systems to effectively compete in the global economy. Topics covered include: information systems and its use in today's global business, enterprise applications, organizations strategy with information systems, e-commerce, digital markets and digital goods, IT infrastructure and emerging technologies, database and information management, systems design, telecommunications, the internet, and wireless technology.

### **BUSN-211 Management Concepts**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall, and on demand

In this course the art and science of management is introduced and examined through multiple perspectives within a global and ethical context. An examination of the functions of a manager (to plan, organize, lead, and evaluate) builds upon the elements of organizational theory and behavioral sciences, leading to topics in motivation and leadership. Principles of organizational structure and design and the importance of management in dealing with the complexity of modern organizations will be emphasized.

### **BUSN-212 Organizational Behavior**

**400(4)**

Prerequisites: BUSN-211

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

The art and science of management is introduced and examined through multiple perspectives within a global and ethical context. An examination of the functions of a manager (to plan, organize, lead, and evaluate) builds upon the elements of organizational theory and behavioral sciences, leading to topics in motivation and leadership. Principles of organizational structure and design and the importance of management in dealing with the complexity of modern organizations will be emphasized. The transformation of products and services for commercialization will be highlighted.

### **BUSN-221 Financial Accounting**

**400(4)**

Prerequisites: MATH-100 or MATH-191

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course presents the principles, practices and procedures used by accountants in processing business data. Units of study include the elements of the accounting cycle plus accounting for cash, accounts receivables, plant and equipment, liabilities, and corporate ownership. Ethical issues are addressed with research into various accounting scandals.

### **BUSN-222 Managerial Accounting**

**400(4)**

Prerequisites: None required (BUSN-221 highly recommended)

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course focuses on the use of financial information in the making of managerial decisions. Subject areas included are the development of manufacturing costs and their control, budgeting, performance analysis, cost-volume-profit analysis, and relevant costs. This course also addresses the ethical issues in managerial accounting.

### **BUSN-271 Statistics for Business**

**400(4)**

Prerequisites: MATH-100 or MATH-191

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course introduces statistical methods to support quantitative decision analysis for solving business problems. Topics covered include probability, sampling, estimation, hypothesis testing, analysis of variance, and linear regression.

### **BUSN-272 Quantitative Business Analysis**

**400(4)**

Prerequisites: BIZ-260 or BUSN-226 or BUSN-271 or MATH-408 or MATH-310 (BUSN-221 or BUSN-222 highly recommended)

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course enables students to improve their mathematical knowledge so they can solve business problems at the workplace. This course focuses on real-world, quantitative situations that you will actually face every day on the job, or in your personal life. The emphasis is on applications to problems in accounting, finance, marketing, production, operations and economics. Methods applied include linear and non-linear equations, geometric series, time-value of money, cost-spreadsheet software to perform computational procedures.

**BUSN-303 New Venture Creation: Entrepreneurship****400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course focuses on the development of an innovative product, service or delivery method into a feasible business model. Students will identify a particular customer need that can be met with a novel approach using a combination of resources, including technology, marketing or financial acumen. Student teams will develop a business plan and stakeholder/investor presentation suitable for an actual funding in one of the following areas: New Venture Entrepreneurship, Social Entrepreneurship or intrapreneurship.

**BUSN-304 Intrapreneurship and Innovation Development****400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course provides the student with an understanding of the best practices of product and service development through application to a course project. Intrapreneurship, the activity of value creation within an existing enterprise, is presented to prepare students to be innovators in their employing organizations. Strategies are introduced for innovation development as practiced by exemplary innovators. Structures are presented that support a successful innovation development environment. Processes utilized for innovation development are contrasted and a general approach is presented with specific application to the course project. Tools and techniques are presented and practiced by students during the completion of the project requirements.

**BUSN-331 Financial Management****400(4)**

Prerequisites: ACCT-212 or ACCT-315 or BUSN-222 or MATH-350

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall and on Demand

This course identifies and discusses the role financial management plays in the successful operation of a business enterprise. Subject areas include capital asset pricing model, capital structure management, financial statement analysis, and decision analysis. Ethical issues facing managers are also emphasized.

**BUSN-332 Financial Markets****400(4)**

Prerequisites: BUSN-222 or ACCT-212

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

The purpose of this course is to provide students with (1) the theoretical models that underlie the value of stocks and bonds and how these items are purchased, (2) an understanding of financial markets and how securities are traded, (3) investment alternatives such as derivative products, mutual funds, options & commodities.

**BUSN-341 Introduction to Marketing****400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This course provides an overview of marketing's role in connecting business to consumers. Emphasis is placed on analyzing the external marketing environment and customers' needs as a basis for developing a firm's marketing strategy. Areas of concern include: marketing research, identifying opportunities, market segmentation, targeting customers, consumer behavior, the business-to-business market, business-to-business buying behavior, product and service planning of existing and new offerings, integrated promotion planning, logistics and channel development, and price planning. SAP exercises may be used in this course to illustrate marketing processes.

**BUSN-342 Product Marketing Management****400(4)**

Prerequisites: BUSN-341

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter Spring

This course provides a foundation of knowledge and skills necessary to be an effective Product Marketing Manager. Students will learn how to effectively manage products throughout their entire life cycle. The class will cover the critical aspects, both on the strategic and tactical levels that are necessary so that product marketing is an ongoing learning experience so that continuous improvement is ensured.

**BUSN-361 Lean Operations Management****400(4)**

Prerequisites: BUSN-211 or MGMT-350

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

The objective of this course is to provide students with an overall understanding of the management of operations activities for both services and manufacturing enterprises. Operations strategies are introduced which identify competitive priorities to support enterprise strategies. Process analysis and quality control tools are introduced within a framework of the principles of Total Quality Management. Methods for the planning and management of operational resources are outlined with applications in services, manufacturing and distribution. The philosophy and techniques of Leans Systems are developed including applications in lean manufacturing and service industries. Lean methods are contrasted

with Traditional Operations Management approaches common to many businesses. ERP simulation instruction is utilized to develop skills in resource planning and understand the importance of enterprise systems in managing businesses.

**BUSN-362 Lean Supply Chain Management**

**400(4)**

Prerequisites: BUSN-361

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

The objective of this course is to provide students with an overall understanding of the management of operations activities of Supply Chain Management (SCM). The course covers concepts, trends and technologies that enable global SCM. Students will learn how customer needs, competitive advantage, operational measures and financial performance support successful implementation of SCM. They will also learn how operational activities including information systems, procurement, demand planning and forecasting, inventory management, and logistics support organizational goals. The philosophy and techniques of Lean Systems are applied to SCM. Lean methods are contrasted with Traditional Operations Management approaches common to many businesses. ERP simulation instruction is utilized to develop skills in logistics and demonstrate the importance of enterprise systems in managing the supply chain.

**BUSN-371 Business Analytics**

**400(4)**

Prerequisites: BUSN-272

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course explores core statistical techniques; data retrieval, analysis and mining; and decision modeling to effectively persuade in the project-oriented world of data-driven decisions.

**BUSN-382 Introduction to Strategy**

**200(2)**

Prerequisites: BUSN-211, BUSN-221, BUSN-222, BUSN-331, BUSN-341, BUSN-361

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course introduces strategy formulation. Topics included are an understanding of the business the firm is in, determining how to position the strategic unit within this business environment, and developing the capabilities to compete in a competitive environment. These topics will be analyzed on both the strategic and functional levels.

**BUSN-383 Strategy Integration I**

**002(2)**

Prerequisites: None

Corequisites: BUSN-382

Minimum Class Standing: None

Terms Offered: Winter, Spring

This lab engages students in all areas of profitable enterprise management: Accounting, Finance, Information Systems, Management, Marketing, and Supply Chain. The simulation gives students an opportunity to design and implement a competitive business strategy which is based on the many research studies in the simulation.

**BUSN-401 International Business**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

The course introduces students to international business and management by studying cultural differences, various governmental regulations, and business structures in a global economy. Other topics include legal and labor agreements, international finance, trade relations, production operations, information technology, global marketing, and human resources planning & development for MNC's.

**BUSN-402 Business Law**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course is an introduction to the concepts and the use of law in business institutions. This class is open to both business and non-business students. This class provides the basic and fundamentals of Business Law and all the major components.

**BUSN-411 Project Management**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

Managing projects within an organizational context, including the processes related to initiating, planning, executing, controlling, reporting, and closing a project. Project integration, scope, time cost, quality control and risk management are addressed in a student-developed personal or work-related project. This course will highlight the importance of people, process and technology in the efficient execution of a project. This course will introduce the use of project management software to organize and track a project's progress. Project management skills are important in any career endeavor.

**BUSN-433 Strategic Investment Management****400(4)**

Prerequisites: BUSN-331, BUSN-332

Corequisites: None

Minimum Class Standing: None

Terms Offered: On Demand

This course is designed to develop an in-depth understanding of investments. Students develop an understanding of debt and equity securities as well as derivatives. Students also apply the theory of investment strategies and techniques through course assignments and case analyses. Topics include the relation between risk and return, portfolio management theories, behavioral finance, equilibrium arbitrage theories, market efficiency, and security analysis.

**BUSN-456 Database Management Systems****400(4)**

Prerequisites: BUSN-152

Corequisites: None

Minimum Class Standing: JR

Terms Offered: On Demand

This course is designed to introduce students to the concepts, principles, issues and techniques for managing corporate data resources. Techniques for managing the design and development of large database systems including logical data models, concurrent processing, data distribution, database administration, data warehousing, data cleansing, and data mining will be covered.

**BUSN-482 Advanced Strategy****200(2)**

Prerequisites: BUSN-382, BUSN-383

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

The topics in the previous strategy class will be covered in more depth with the addition of the topics of formulating long-term objectives and strategic considerations in the global environment. These topics will be analyzed on both the strategic and functional levels.

**BUSN-483 Strategy Integration II****002(2)**

Prerequisites: BUSN-382, BUSN-383

Corequisites: BUSN-482

Minimum Class Standing: None

Terms Offered: Winter, Spring

In the course students will design, implement, and document a project strategy for a business. The project will emphasize business strategy but will be multiple disciplinary within business. This project will be small in scope.

**BUSN-484 Business Design Project****004(4)**

Prerequisites: BUSN-382, BUSN-383, BUSN-482, BUSN-483

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

In the course students will design, implement and document a project strategy for a business. The project will emphasize business strategy but will be multiple disciplinary within business. This project will be large in scope.

**CE-210 Digital Systems I****302(4)**

Prerequisites: ECE-101 or CS-101 or IME-211

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Design and analysis techniques for combinational and sequential logic circuits are studied. Topics include binary number systems and binary addition/subtraction, combination logic minimization, frequently used combinational logic circuits, finite state machines, shift registers and counters. VHDL will be used for description, simulation and FPGA synthesis of digital circuits.

**CE-320 Microcomputers I****302(4)**

Prerequisites: CE-210

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Principles of microcomputer hardware and software are presented. Topics include instruction sets and addressing modes, structured assembly language programming, topdown design, introductory machine architecture and its relationship to programming, introduction to hardware in typical microcontrollers, and an introduction to programming microcontrollers in C.

**CE-412 Digital Systems II****302(4)**

Prerequisites: CE-210

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer of even years, Fall of odd years

This digital systems course covers the principles and practices used in the design of modern complex combinational and sequential digital systems. Digital logic design, analysis, simulation, and implementation techniques are covered. Fundamental algorithms underlying computer-aided design (CAD) tools are studied. Schematic diagrams and hardware description languages (HDL) are used to specify designs targeted for

implementation in technologies ranging from discrete ICs to programmable logic devices and ASICs. The course has a laboratory component that allows students to exercise the principles and practices learned.

#### **CE-420 Microcomputers II**

**302(4)**

Prerequisites: CE-320

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This advanced course in Microcomputer Systems covers the architectural features, design principles, development tools and techniques of advanced embedded microcomputers. The topics include architectures of contemporary 16-bit and 32-bit RISC microcontrollers (considering Microchip PIC24 and PIC32 as example cases for the practical development experiences), instruction set, addressing modes, software development & debugging, parallel and serial interfacing, interrupts, timer module, ADC module, etc.; The course has a strong laboratory component, which will be carried out on a microcomputer development kit with the latest family of 16-bit and 32-bit microcontrollers.

#### **CE-422 Computer Architecture and Organization**

**302(4)**

Prerequisites: CE-320

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

The fundamental concepts in computer architecture and organization are presented. Laboratory assignments using VHDL simulation are a major portion of the course. Topics include fixed point and floating point computer arithmetic; assessing and understanding performance; control unit design; microprogramming; memory organization; cache design; a 32-bit instruction-set architecture; single-cycle, multicycle and pipelined CPU architectures; RISC architecture; examples of commercial computer architectures.

#### **CE-424 VLSI Design**

**302(4)**

Prerequisites: CE-320, EE-210

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter of odd years, Spring of even years

Design techniques and basic theory of integrated circuit design are discussed. Topics include review of the semiconductor physics associated with NMOS and PMOS transistors; fabrication process; CMOS combinational circuits; memory cells; stick diagrams; layout techniques using CAD tools; circuit extraction and analysis. A project is completed.

#### **CE-426 Real-Time Embedded Systems**

**302(4)**

Prerequisites: CE-320

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

Implementation and applications of real-time embedded computers are studied. Topics include the case study of an embedded real-time operating system, typical applications of embedded computers, real-time hardware and software interfacing, and real-time scheduling algorithms. This course includes a lab component with several short design projects and a final directed design project.

#### **CE-430 Logic Systems**

**302(4)**

Prerequisites: CE-320, EE-210, EE-211

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer of odd years, Fall of even years

This course introduces several types of logic systems and their applications. Topics in asynchronous logic are covered, including design and analysis of asynchronous sequential networks, races, and various types of hazards. The course also covers ladder logic and its implementation in programmable logic controllers. Additionally, an introduction to fuzzy logic is studied, including membership functions, rule creation and evaluation, and applications. This course has a laboratory component that allows students to implement the various logic systems in hardware and software.

#### **CE-442 Introduction to Mobile Robotics**

**302(4)**

Prerequisites: CE-320

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter of odd years, Spring of even years

This course covers the fundamentals of robotics with an emphasis on mobile robots, which are intelligent integrated mechanical, electrical and computational systems functioning in the physical world. Topics include state-of-the-art technologies in mobile robotics, such as locomotion, sensing, control, communication, localization, mapping, navigation, etc. Advanced topics such as coordination of multiple mobile robots will also be introduced. The course aims to provide both theoretical and practical experience to students through lectures and hands-on experience with real robots and simulation software.

#### **CE-460 Massively Parallel Processors**

**400(4)**

(This course is equivalent to CE-660)

Prerequisites: CE-320 or Instructor approval

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer of even years, Fall of odd years

This course introduces using massively parallel processors utilizing hundreds of processing course, those typically used as graphics processing units, for general purpose scientific computing. Topics include the architectural differences between a GPU and a traditional CPU, a decomposing problems to efficiently utilize GPUs, performance optimization techniques, and case studies. This course contains a directed project that allows the student to compare the performances of CPUs and GPUs on data-parallel algorithms.

### **CE-470 Haptic Systems**

**302(4)**

Prerequisites: CS-101

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter of even years, Spring of odd years

This course provides the required theoretical and practical background to design and development of haptic systems. Haptic technology enables computer users to touch and/or manipulate virtual or remote objects in simulated environments or tele-operation systems. This course aims to cover the basics of haptics through lectures, homework, lab assignments, a term project, and readings on current topics in haptics. Through lab assignments, students learn to create haptic-enabled virtual environments using a haptic device. Topics include current haptic technology and devices, the human haptic system, human haptic perception and psychophysics, haptic rendering of virtual objects.

### **CE-480 Computer Networks**

**302(4)**

Prerequisites: CE-320, MATH-408

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

Organization, analysis, and design of interconnected systems of computers are studied. Topics include the Open System Interconnection model; the Internet reference architecture; network topology; media types; protocol; Ethernet; routing; TCP/IP; HTTP, wireless and mobile networks, multimedia Internet, industrial networks; and Internet applications.

### **CE-482 Distributed Embedded Systems**

**302(4)**

Prerequisites: CE-320

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer of odd years, Fall of even years

This course addresses the most important topics in embedded systems operating in a network environment. Topics include: typical applications of distributed embedded systems, digital control systems, real-time scheduling and complete commercial hardware and software development environment that supports rapid prototyping, automated code generation, and debugging is used in laboratory assignments and a term project to develop a complete distributed embedded application. Automotive applications are emphasized.

### **CE-490 Senior Computer Engineering Design Project**

**204(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: Senior Thesis Standing in Computer Engineering

Terms Offered: Winter, Spring

Students are prepared for engineering practice through a major design experience based on knowledge and skills acquired in earlier course work. They work in teams to design and develop a prototype embedded-computer or other complex digital system to meet a given specification. The specification requires the design to incorporate relevant engineering standards and to address most of the following: manufacturability, sustainability, and economic, environmental, ethical, health and safety, social, and political considerations. Designs are documented in a professional manner and presented publicly.

### **CHEM-135 Principles of Chemistry**

**300(3)**

Prerequisites: None

Corequisites: CHEM-136

Minimum Class Standing: None

Terms Offered: Summer, Fall

An introduction to fundamental concepts and applications of chemistry, including the Periodic Table and chemical nomenclature, reactions and reaction stoichiometry, atomic structure, chemical bonding and chemical equilibrium. Applied topics include batteries, fuel cells and corrosion, and a description of the chemistry and uses of metals and nonmetals.

### **CHEM-136 Principles of Chemistry Laboratory**

**002(1)**

Prerequisites: None

Corequisites: CHEM-135

Minimum Class Standing: None

Terms Offered: Summer, Fall

The laboratory introduces and/or illustrates chemical concepts and principles, and teaches the skills of data collection and evaluation. The SI system is emphasized.

### **CHEM-137 General Chemistry I**

**310(3)**

Prerequisites: None

Corequisites: CHEM-136

Minimum Class Standing: None

Terms Offered: Summer, Fall

An introduction to fundamental concepts of chemistry, including the Periodic Table, chemical nomenclature, reactions and reaction stoichiometry, atomic structure and chemical bonding. The course is open to all science majors, and is required for Chemistry majors. Non-science majors require permission of Chemistry Discipline Chair.

**CHEM-145 Industrial Organic Chemistry**

**300(3)**

Prerequisites: None

Corequisites: CHEM-146

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

An introduction to the important organic reactions used for the industrial synthesis of fuels, lubricants, solvents, fine chemicals and polymeric materials. The relationship between structure and the chemical, physical and spectroscopic properties of organic materials will be emphasized.

**CHEM-146 Industrial Organic Chemistry Laboratory**

**002(1)**

Prerequisites: None

Corequisites: CHEM-145

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

A laboratory course to accompany and reinforce the theoretical concepts of organic chemistry covered in CHEM-145. The course will cover safety aspects of organic chemistry, the reactions of organic functional groups and identification of organic chemicals and polymers using chromatography, thermal analysis and infrared spectroscopy techniques.

**CHEM-223 Introduction to Polymer Science**

**400(4)**

Prerequisites: CHEM-135 or CHEM-137

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

An introduction to the fundamental principles of Polymer Science. Topics include the relationship between polymer structure and engineering properties with discussions of the most widely used polymeric materials and processes in terms of their relative costs, design parameters, and applications - thermal, mechanical, and rheological testing is discussed as well as the environmental impact of polymeric materials. Each lecture is augmented by displays of fabricated parts which illustrate general plastic selection principles. Each student makes an oral and written presentation which illustrates the application of polymer science to a specific material, design and/or process.

**CHEM-237 General Chemistry II**

**310(3)**

Prerequisites: CHEM-135 or CHEM-137

Corequisite: CHEM-238

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

General Chemistry II, is a continuation of CHEM-137, General Chemistry I. Topics covered include: properties of gases, thermochemistry, chemical thermodynamics, ideal and non-ideal solutions, chemical equilibrium, chemical kinetics, nuclear chemistry, and electrochemistry.

**CHEM-238 General Chemistry II Laboratory**

**003(1)**

Prerequisites: CHEM-135 or CHEM-137

Corequisites: CHEM-237

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

This laboratory course, taken concurrently with CHEM-237, is designed to continue exploring the experimental principles of chemistry not covered in CHEM-136 or CHEM-138. Topics covered include empirical formulas of hydrates, gas laws, heats of reactions, freezing point depression, iodine clock, acid dissociation constant determination, buffers, solubility product constant determination, electrolysis of water, and the determination of thermodynamic properties.

**CHEM-245 Applied Chemistry for Engineers**

**400(4)**

Prerequisites: CHEM-135 or CHEM-137

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course will apply the knowledge gained in CHEM-135, Principles of Chemistry, to real world situations. In addition, topics not covered in CHEM-135 will be introduced along with their applications. New topics include: forms of energy, fuels, nuclear chemistry, corrosion, surfaces, polymers and plastics, ceramics and composites. Fuel cells and their basic chemistry are an important component of this class.

**CHEM-247 Survey of Organic Chemistry**

**400(4)**

Prerequisites: CHEM-135 or CHEM-137

Corequisites: None

Minimum Class Standing: FR2

Terms Offered: Winter, Spring

This course teaches the basic principles of organic chemistry. Topics covered in detail include bonding, functional groups, nomenclature, molecular structure, and chemical reactivity. Other fundamental properties of organic molecules such as acidity/basicity, stereochemistry, and reaction mechanisms will be covered.

**CHEM-345 Organic Chemistry I**

**400(4)**

Prerequisites: CHEM-237



Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

A thorough coverage of the chemistry of hydrocarbons: valence theory, stereochemistry, structure, addition polymerization, reaction mechanisms and spectroscopy. Appropriate for science majors and environmental Chemistry minors.

**CHEM-346 Organic Chemistry I Laboratory**

**004(2)**

Prerequisites: CHEM-237, CHEM-238

Corequisites: CHEM-345

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This laboratory develops the basic skills needed for the separation, identification and synthesis of organic compounds. Instrumental techniques introduced will include FTIR, UV-VIS, GC and GC/MS. One 4-hour laboratory per week.

**CHEM-347 Organic Chemistry II**

**400(4)**

Prerequisites: CHEM-345

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: Winter, Spring

A continuation of CHEM-345, with an emphasis on the chemistry of the organic functional groups, and the synthesis of polyfunctional molecules. Appropriate for science majors.

**CHEM-348 Organic Chemistry II Laboratory**

**004(2)**

Prerequisites: CHEM-345, CHEM-346

Corequisites: CHEM-347

Minimum Class Standing: SO2

Terms Offered: Winter, Spring

A continuation of CHEM-346, with an emphasis on the advanced techniques used to synthesize multifunctional organic compounds. Instrumental methods will be intensively utilized to characterize complex chemical structures.

**CHEM-351 Biochemistry I**

**400(4)**

Prerequisites: CHEM-345, CHEM-346

Corequisites: CHEM-352

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This course will focus on the basic principles of biochemistry. Coverage includes a thorough description of the biochemical framework - amino acids, proteins, enzymes, lipids, membranes, carbohydrates, nucleic acids, DNA, and RNA. In addition, the energetics and metabolism of a number of biological processes will be introduced.

**CHEM-352 Biochemistry I Lab**

**004(2)**

Prerequisites: CHEM-345, CHEM-346

Corequisites: CHEM-351

Minimum Class Standing: SO

Terms Offered: Summer, Fall

An introduction to biochemistry laboratory procedures for the separation and analysis of biologically important molecules. This course also covers techniques and methodology important in the biotechnology field.

**CHEM-361 Physical Chemistry I**

**400(4)**

Prerequisites: CHEM-237, CHEM-238, PHYS-224, PHYS-225, and MATH-102 or MATH-102X or MATH-102H

Corequisites: CHEM-362

Minimum Class Standing: JR

Terms Offered: Summer, Fall

A first course in physical chemistry, covering the topics of chemical thermodynamics, gas laws, solutions, transport properties, phases and phase diagrams, electrochemistry, colligative properties and the physical chemistry of macromolecules.

**CHEM-362 Physical Chemistry I Lab**

**004(2)**

Prerequisites: None

Corequisites: CHEM-361

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This laboratory will illustrate principles covered in the CHEM-361 lecture and introduce the student to methods used in determining physical relationships in nature. Topics include equilibrium, phase diagrams, solutions, thermodynamics, gases, transport properties and error analysis.

**CHEM-363 Physical Chemistry II**

**400(4)**

Prerequisites: CHEM-237, CHEM-238, MATH-203, PHYS-224, PHYS-225, CHEM-361 or permission of instructor

Corequisites: CHEM-364

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

The second course in the physical sequence, continuing topics introduced in CHEM-361, Physical Chemistry I. Topics covered will include kinetic molecular theory, kinetics, quantum mechanics, solids and surfaces, photochemistry, atomic and molecular structure theory, spectroscopy, statistical mechanics.

**CHEM-364 Physical Chemistry II Laboratory**

**004(2)**

Prerequisites: None

Corequisites: CHEM-363

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

This laboratory will illustrate principles covered in the CHEM-363 lecture and introduce the student to methods used in determining physical relationships in nature. Topics include kinetics, quantum mechanics, solids, surface chemistry, electrochemistry, photochemistry, and spectroscopic techniques.

**CHEM-373 Analytical Chemistry**

**310(4)**

Prerequisites: CHEM-237, CHEM-238, CHEM-345, CHEM-346

Corequisites: CHEM-374

Minimum Class Standing: JR2

Terms Offered: As Needed

This course is designed to introduce the student to classical and modern instrumental analytical chemistry. The fundamentals of analytical statistics, acid/base calculations, titrations, basic chemical equilibrium, atomic and molecular spectroscopic, chromatographic, and electroanalytical methods of analysis will be covered.

**CHEM-374 Analytical Chemistry Laboratory**

**004(2)**

Prerequisites: CHEM-237, CHEM-238, CHEM-345, CHEM-346

Corequisites: CHEM-373

Minimum Class Standing: JR2

Terms Offered: As Needed

This laboratory course covers the qualitative and quantitative analysis of chemical compounds including gravimetric, volumetric, and spectrophotometric methods.

**CHEM-437 Advanced Inorganic Chemistry**

**400(4)**

Prerequisites: CHEM-237, CHEM-345

Corequisites: CHEM-438

Minimum Class Standing: JR

Terms Offered: As Needed

This course includes in-depth coverage of the fundamentals of inorganic and bioinorganic chemistry, including structure and bonding of inorganic compounds, as well as their chemical periodicity and reactions. The descriptive chemistry of metals, non-metals and coordination compounds will also be discussed.

**CHEM-438 Advanced Inorganic Chemistry Lab**

**004(2)**

Prerequisites: CHEM-238, CHEM-346

Corequisites: CHEM-437

Minimum Class Standing: JR

Terms Offered: As Needed

This laboratory component is an introduction to the techniques used in the synthesis and characterization of metal complexes and organometallic compounds, including bioinorganic compounds. This course is open to all science majors and is required for chemistry majors. One 3-hour laboratory per week.

**CHEM-451 Biochemistry II**

**400(4)**

Prerequisites: CHEM-351, CHEM-352

Corequisites: CHEM-452

Minimum Class Standing: JR2

Terms Offered: As Needed

This course serves as a comprehensive advanced Biochemistry lecture course. It will cover topics related to the biochemistry of the human body, including the breakdown and synthesis of glucose, fatty acids, amino acids, and nucleotides.

**CHEM-452 Biochemistry II Lab**

**004(2)**

Prerequisites: CHEM-351, CHEM-352

Corequisites: CHEM 451

Minimum Class Standing: JR2

Terms Offered: As Needed

This course serves as a comprehensive advanced Biochemistry laboratory. It will cover topics related to the isolation and manipulation of DNA and proteins. Including techniques such as PCR, Western blotting, mutagenesis, DNA Fingerprinting, and molecular modeling.

**CHEM-461 Colloid Science**

**400(4)**

Prerequisites: CHEM-361 or CHEM-237 and MECH-320 or CHEM-237 and PHYS-452

Corequisites: CHEM-462

Minimum Class Standing: JR

Terms Offered: As Needed

This course is an introduction to Colloid and Surface Chemistry and will cover colloids, micelles, self-assembled monolayers, thin films, foams, polymers, ceramics, gels, emulsions and sols. The physical properties and methods of studying colloids will also be addressed.

**CHEM-462 Colloid Science Laboratory**

**004(2)**

Prerequisites: CHEM-362 or CHEM-237 and MECH-320 or CHEM-237 and PHYS-452

Corequisites: CHEM-461

Minimum Class Standing: JR

Terms Offered: As Needed

This laboratory course investigates the preparation, properties and characterization of colloids and colloidal systems.

**CHEM-477 Advanced Organic Chemistry**

**400(4)**

Prerequisites: CHEM-347, CHEM-348

Corequisites: CHEM-478

Minimum Class Standing: SR

Terms Offered: As Needed

This course serves as senior level chemistry elective. It will cover topics including the principles of structure/reactivity, reaction mechanisms, kinetic and thermodynamic control of reactions, radical and photochemistry, organometallic chemistry and total organic synthesis.

**CHEM-478 Advanced Organic Chemistry Lab**

**004(2)**

Prerequisites: CHEM-347, CHEM-348

Corequisites: CHEM-477

Minimum Class Standing: SR

Terms Offered: As Needed

This course serves as senior level chemistry elective. The laboratory develops the skills needed to perform variety of organic reactions including photochemistry and organometallic chemistry. It also allows the student to use the knowledge developed to design and carry out a total synthesis for a target compound. Student will employ the separation, purification and identification techniques learned in CHEM-348 to perform the labs. One 4-hour laboratory per week.

**CHEM-494 Senior Research/Seminar I**

**006(2)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: All

This course will introduce the student to the techniques for literature search and document retrieval. Students will initiate a research project under the direction of a chemistry or biochemistry faculty member. Each student will prepare and present a seminar based on their research progress. Each student will also prepare a written report on their research project.

**CHEM-496 Senior Research/Seminar II**

**006(2)**

Prerequisites: CHEM-494

Corequisites: None

Minimum Class Standing: SR

Terms Offered: All

Seniors will conclude a senior research project with a faculty member, and prepare and present a seminar dealing with progress achieved during the research period. Guest seminar lectures by visiting faculty, industry or government scientists will also be scheduled. This course may be repeated twice for a total of six credits.

**CHME-100 Introduction to Chemical Engineering**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This introductory course for chemical engineering is designed to introduce students to the discipline of chemical engineering. Class topics include discussion of what chemical engineers do in practice, basic calculations related to chemical engineering, hands-on experiences to improve the understanding of how basic chemical processes work, experiments to demonstrate core concepts, team work skills, time management, spreadsheet and process flow diagram development, and student research opportunities.

**CHME-200 Mass and Energy Balance**

**400(4)**

Prerequisites: CHEM-237, and MATH-102 or MATH-102X or MATH-102H

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This introductory course is the study of mass and energy balance for small and large scale industrial plants. The application of mass balances for individual species for steady state operation of systems with chemical reactions is discussed. The energy balances for components and systems will be analyzed to find the energy requirements for operations at industrial scale.

**CHME-210 Chemical Engineering Thermodynamics I**

**400(4)**

Prerequisites: CHME-200

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course is the introductory course in chemical engineering thermodynamics. This course will focus on developing the theory of thermodynamics and its applications to chemical engineering. Energy and entropy balances will be utilized for analyzing small and large scale processes with multiple streams to compute workloads, energy exchange, and energy efficiency. Beginning with small unit operations, including pumps, compressors, turbines, and heat exchangers, larger systems will be developed and analyzed including power cycles and refrigeration cycles. Computation of thermodynamic properties for ideal and non-ideal systems will be discussed using charts, tables, and equations of state. The course is designed for the sophomore level and will continue with a secondary thermodynamics course during the junior year.

**CHME-300 Fluid Dynamics and Heat Transfer****310(3)**

Prerequisites: CHME-210, and MATH-203 or MATH-203H

Corequisites: CHME-301, and MATH-204 or MATH-204H

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This course demonstrates the application of fluid mechanics, phase transitions, and heat transfer in chemical engineering. Fluid studies including statistics, dynamics, friction losses, Newtonian and non-fluids, pumps, and metering of flows will be discussed. Mixing and agitation processes will be presented. Heat transfer processes, heat exchangers, evaporation and other heat transfer applications involving phase change will be discussed.

**CHME-301 Fluid Dynamics and Heat Transfer Laboratory****002(1)**

Prerequisites: CHME-210, and MATH-203 or MATH-203H

Corequisites: CHME-300, MATH-204

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This laboratory course demonstrates the application of fluid mechanics, heat and mass transfer in chemical engineering. Process measurement and the importance of accuracy and precision in industrial measurement applications are covered. Fluid static, dynamics, and metering of flows will be demonstrated. Agitation and mixing process are covered. Different modes of heat transfer with phase change in chemical engineering processes will be presented.

**CHME-400 Mass Transfer and Separations****310(3)**

Prerequisites: CHME-300

Corequisites: CHME-401

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This course will introduce the applications of chemical engineering separation processes. Binary separations and multi-component separations including distillation, absorption, adsorption, leaching, drying, evaporation, extraction, membranes, filtration, and crystallization will be covered. Design of gas/liquid, liquid-liquid and liquid-solid separation processes will be discussed; methods covered include McCabe-Thiele methods, short-cut methods, sizing plate columns and packed columns, plate and column efficiencies, and mass transfer coefficient. Practical applications of mass transfer rates will be covered. Special topics including separation of azeotropes and combined separation units may be included.

**CHME-401 Mass Transfer and Separations Laboratory****002(1)**

Prerequisites: CHME-300

Corequisites: CHME-400

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This laboratory course will apply the principles learned in Mass Transfer and Separations (CHME-400). Experiments will include binary separations and multi-component separations including distillation, diffusion, absorption, adsorption, filtration, drying, evaporation, extraction, and crystallization. Simulated experiments will be conducted using ASPEN software.

**CHME-410 Chemical Engineering Thermodynamics II****400(4)**

Prerequisites: CHME-210

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This advanced chemical engineering thermodynamics course is designed to follow CHME-210. The course will focus on developing relationships for vapor/liquid equilibrium (VLE) for both ideal and non-ideal systems, with focus on equations of state and activity models. Additionally, topics such as liquid-liquid equilibrium (LLE) will be analyzed for ideal and non-ideal systems. Solution theory including fugacity, partial properties, excess properties, and heat effects of mixing processes will be discussed. Other topics introduced through this course include chemical reaction equilibria – reaction coordinates, effects of temperature on equilibrium constants, and relationships between equilibrium constants and composition.

**CHME-420 Applied Transport Phenomena****310(3)**

Prerequisites: CHME-300, MATH-204 or MATH-204H

Corequisites: CHME-421

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This advanced chemical engineering course will focus heavily on mathematical interpretations of the principles of heat and mass transfer, steady and transient conduction and diffusion, and radiative heat transfer. Convective transport of heat and mass in both laminar and turbulent flows will also be discussed. The course also provides an emphasis on the development of the physical understanding of the underlying phenomena and on the ability to solve real heat and mass transfer problems of engineering significance.

**CHME-421 Applied Transport Phenomenon Laboratory****002(1)**

Prerequisites: CHME-300, MATH-204 or MATH-204H

Corequisites: CHME-420

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This laboratory course will introduce concepts of laminar and turbulent fluid flow. Heat and momentum transfer will be studied. Overall heat transfer and overall mass transfer coefficients will be examined. Experiments related to reactor start-up, transient behavior and steady state operation will be evaluated. Analysis of boiling, condensing, evaporation and filtration will be performed.

### **CHME-435 Process Control**

**310(3)**

Prerequisites: CHME-400, MATH-204 or MATH-204H

Corequisites: CHME-436

Minimum Class Standing: SR

Terms Offered: Winter, Spring

This course will provide an understanding of the basic principles and methods underlying the steady state and dynamic characterization of chemical process control. This course introduces dynamic processes and the engineering tasks of process operations and control. Subject covers modeling the static and dynamic behavior of processes; control strategies; fundamentals and design of PID feedback, feed forward, cascade, and other control structures; controls equipment and instrumentation; statistical design of experiment; and process monitoring and statistical process control.

### **CHME-436 Process Control Laboratory**

**002(1)**

Prerequisites: CHME-400, MATH-204 or MATH-204H

Corequisites: CHME-435

Minimum Class Standing: SR

Terms Offered: Winter, Spring

This laboratory course will apply the principles and methods of steady state dynamic characterization of chemical process control. Modeling the static and dynamic behavior of processes will be performed using software. Heat exchange, reactors, distillation and separation experiments will be performed to evaluate the effect of process control strategies. The design of feedback, feed forward, and other control strategies will be applied to process equipment.

### **CHME-440 Senior Chemical Engineering Design I**

**400(4)**

Prerequisites: ECON-201, CHME-400, CHME-450

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Winter, Spring

This is the first of two advanced design courses incorporating core chemical engineering principles into the design of a plant. Topics related to plant design include optimization, plant economics and profitability, safety and environmental considerations, and ethics. Computer simulation tools will be used to aid in the designs. Three to four major designs will be completed in the form of design reports and oral presentations. Contemporary topics will be incorporated into the design projects.

### **CHME-450 Reaction Engineering**

**310(3)**

Prerequisites: CHME-300

Corequisites: CHME-410, CHME-451

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course applies the concepts of reaction rates, stoichiometry and equilibrium to the analysis of chemical reacting systems, derivation of rate expressions from reaction mechanisms and equilibrium or steady state assumptions, design of chemical reactors via synthesis of chemical kinetics, transport phenomena, and mass energy balances. Topics covered include: batch, plug flow and continuously stirred reactors for chemical reactions and heterogeneous catalysis; and heat and mass transport in reactors.

### **CHME-451 Reaction Engineering Laboratory**

**002(1)**

Prerequisites: CHME-300

Corequisites: CHME-410, CHME-450

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course applies the concepts of reaction rate, stoichiometry and equilibrium to the design and operation of chemical reactors. Plus flow, batch and continuously stirred tank reactors will be run at various conditions. Reactor analysis will allow for the determination of kinetics, catalyst activity, and temperature, and concentration dependence of reactions.

### **CHME-480 Senior Chemical Engineering Design Capstone**

**400(4)**

Prerequisites: CHME-435, CHME-440

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This is the second of two advanced courses incorporating core chemical engineering principles into the design of a plant. Concepts built through the first semester course will be strengthened and applied to new design projects. Additional design topics including debottlenecking and troubleshooting will be introduced. Optimization to improve process performance and energy savings will be utilized and applied to course projects. Green engineering and environmental standards will be discussed as related to chemical engineering design. Students will complete large-scale industrial design projects in teams throughout the course. Finally, chemical product design concepts and strategies will be discussed.

### **CHN-101 Beginning Chinese I**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is an introduction to speaking, reading and writing Chinese. Students develop listening and conversational skills and learn to write and read Chinese characters. It covers basic Chinese grammatical structures and its usage. It also includes some discussion of Chinese culture as needed to understand the relationship between the language and the culture. Students are eligible to take this course only if they have less than one year of high school Chinese or less than one term of college Chinese (or by consent of the head of the Department of Liberal Studies). This course counts for Free Elective credit and cannot be substituted for any of the general education courses required of all students.

### **CHN-102 Beginning Chinese II**

**400(4)**

Prerequisites: CHN-101

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the second in a three-part introduction to speaking, reading and writing Chinese. Students develop listening and conversational skills and learn to write and read Chinese characters. It covers basic Chinese grammatical structures and its usage. It also includes some discussion of Chinese culture as needed to understand the relationship between the language and the culture. Students are eligible to take this course only if they have less than two years of high school Chinese or less than two terms of college Chinese (or by consent of the head of the Department of Liberal Studies). This course counts for Free Elective credit and cannot be substituted for any of the general education courses required of all students.

### **CHN-103 Beginning Chinese III**

**400(4)**

Prerequisites: CHN-101, CHN-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the third in a three-part introduction to speaking, reading and writing Chinese. Students develop listening and conversational skills and learn to write and read Chinese characters. It covers basic Chinese grammatical structures and its usage. It also includes some discussion of Chinese culture as needed to understand the relationship between the language and the culture. Students are eligible to take this course only if they have less than three years of high school Chinese or less than three terms of college Chinese (or by consent of the head of the Department of Liberal Studies). This course counts for Free Elective credit and cannot be substituted for any of the general education courses required of all students.

### **COMM-101 Written & Oral Communication I**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course is designed to help students write and speak effectively in academic settings and in their work organizations. Basic principles underlying practical communication techniques are taught, with an emphasis on skills for conveying technical and business information. Students engage in writing and speaking assignments that familiarize them with appropriate formats for those kinds of communication. Student performance is analyzed as a means of promoting individual improvement.

### **COMM-301 Written & Oral Communication II**

**400(4)**

Prerequisites: COMM-101

Corequisites: None

Minimum Class Standing: JR

Terms Offered: All

The course prepares students to launch their thesis project and to perform other advanced writing and speaking tasks. Thus students will employ the concepts and skills gained in the foundational course Written & Oral Communication I (COMM101). Emphasis is placed on helping students to communicate effectively in regard to the technologies and business purposes of their own workplace and profession. Students' development of the required skills is demonstrated in writing assignments and oral presentations. Credit must be received for the course before a student's Senior Thesis Assignment Proposal will be processed for its approval.

### **COMM-311 Rhetorical Principles of Persuasion**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

Theories of persuasion, techniques of argumentation, and the analysis of persuasive texts. Topics include political speeches and campaign messages, rhetorical interpretation of advertising and business communication, and persuasive elements of popular culture. Verbal and visual elements of persuasion will be addressed. Students will apply these concepts by written analyses of persuasive texts and by composing and delivering persuasive speeches.

### **COMM-313 Rhetorical Principles of Public Speaking**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

Understanding the processes and contexts of public speaking, including audience adaptation, principles of clear organization, development of ideas, and techniques of effective persuasive and informative speaking. Although the focus of the course is on analysis of great speeches throughout history, the course provides an opportunity for students to practice speaking about topics of current interests.

**COMM-435 Written & Oral Communication for Overseas Students**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Fall, Spring

This course, intended for overseas students, seeks to heighten their awareness of American business communication practices. It will help develop a systematic approach to written and oral communication in the workplace. Topics include the nature of organizational communication and business writing, including techniques for writing letters, memoranda, proposals, and reports. Electronic communication practices are examined. Emphasis is also placed on professional communication skills in multicultural environments and relevant current events. This course does not receive credit in any Kettering University degree program.

**CS-101 Computing and Algorithms I**

**006(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

An introduction to algorithmic problem solving, with emphasis on elementary program and software engineering techniques. Syntax and semantics of a modern programming language; programming and debugging at the file level; true object-orientation; Strings, arrays, sorting, inheritance, and exception handling.

**CS-102 Computing and Algorithms II**

**302(4)**

Prerequisites: CS-101

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A second course in algorithmic problem solving. Recursion, abstract data types, dynamic data structures, comparison-based sorting, elementary algorithm analysis, design of software projects of moderate size, and continuing development of programming skills.

**CS-202 Systems Programming Concepts**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

Fundamental system programming concepts are examined using the C programming language. Topics include: machine organization, data representation, interrupt handling, I/O, file management, dynamic structures, parameter passing, memory management, system calls, process creation, process control, interprocess communication, and language interfaces.

**CS-203 Computing & Algorithms III**

**302(4)**

Prerequisites: CS-102, CS-211

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

The design and analysis of advanced data structures and algorithms. Algorithm design techniques, algorithm analysis techniques, advanced data structures, advanced sorting, applications to various problem domains.

**CS-211 Discrete Mathematics**

**400(4)**

Prerequisites: None

Corequisites: MATH-101 or MATH-101X

Minimum Class Standing: None

Terms Offered: All

Propositional and first-order logic; logical equivalence and inference. Proof techniques, mathematical induction and principle of diagonalization. Set operations, relations, functions. Introduction to graphs and trees and their applications to computer science. Lattice structures and Boolean algebras. Truth tables and minimization of Boolean expressions.

**CS-300 The Computing Professional**

**400(4)**

Prerequisites: CE-210 or CS-102, COMM-101

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall, alternate years

An examination of the profession of computing from historical and ethical perspectives. Overview of the history of computing, from the earliest computational devices and theoretical foundations to modern developments. Discussion of the social impact of computing on society and the ethical implications for computing professionals, including analysis of case studies.

**CS-312 Theory of Computation**

**400(4)**

Prerequisites: CS-102, CS-211

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall, alternate years

Regular languages and grammars; finite-state machines and transducers; relationships between finite-state automata and regular languages. Context-free languages and grammars; language recognition with stack machines and parsers. Properties of formal languages. Computability and undecidability. Introduction to computational complexity.

### **CS-320 Computer Graphics**

**302(4)**

Prerequisites: CS-102, and MATH-101 or MATH-101X

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring, alternate years

An introduction to computer graphics. Rendering and curve drawing techniques, clipping algorithms, light and reflection models, object transformations. Introduction to three-dimensional graphics.

### **CS-331 Programming Language Design**

**400(4)**

Prerequisites: CS-203, CS-312

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

A study of the principles behind the design of programming languages. Syntactical design, control structures, data structures, naming and environments, language design tools, historical development, implementation issues.

### **CS-341 Web Software Tools**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, alternate years

World Wide Web programming tools. Various markup languages, several scripting languages, web services, web servers and relational databases - all the skills and tools needed to create dynamic web-based applications.

### **CS-385 Introduction to Game Design**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, alternate years

This course will study the technology, science, and art involved in the creation and design of computer games. The course will emphasize hands-on development of games and consider a variety of software technologies relevant to games.

### **CS-415 Cryptography**

**400(4)**

Prerequisites: CS-203

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall, alternate years

A study of modern data security. Mathematical foundations of cryptography. Classical cryptographic systems and computer attacks on these systems. Cryptographic security over unsecure communication paths: cryptographic protocols, oblivious transfers, proofs of identity, signature schemes. Modern cryptographic systems: data encryption standards, public-key systems, key generation and management. External considerations are presented and discussed: security organizations role in security, privacy considerations, import/export issues.

### **CS-420 Multimedia Design**

**302(4)**

Prerequisites: CS-320

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall, alternate years

This course introduces the basics of multimedia design and development. Topics include 3D mesh modeling, animation, video editing, audio editing, and the development of interactive virtual environments.

### **CS-425 Parallel Models and Algorithms**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

An introduction to various models for parallel computation, such as PRAM models, vector processors, interconnection networks, trees, meshes, hypercubes, and sorting networks. Performance measures for parallel models and for parallel algorithms. Parallel algorithms for searching, sorting, merging, trees, graphs, and the study of their efficiency. Implementation of some parallel algorithms are on a parallel machine.

### **CS-431 Compiler Design and Construction**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed



A study of compiler design techniques; scanning, parsing, error recovery and intermediate code generation and optimization; tools for compiler construction, including scanner generators and compiler-compilers. Construction of a working compiler front-end.

**CS-435 Functional Languages and Parsing**

**400(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, alternate years

Introduction to contemporary functional programming languages and techniques: lists, first class and higher order functions, lazy evaluation, and infinite data structures. Introduction to context free languages and parsing techniques: LL(k), LR(k). Construction of hand written parsers and use of automated tools for parser construction.

**CS-451 Operating Systems**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Operating system function and implementation; process and thread management, scheduling and synchronization; deadlock; real and virtual memory management, file-system structure and implementation. Case studies of historical and modern operating systems.

**CS-455 Computer and Network Security**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring, alternate years

A study of security in computing systems, including policies, audit, and protection. Physical and personnel security, security of network services, firewall construction and evaluation. Incident response.

**CS-458 Computer and Network Forensics**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall, alternate years

Forensic analysis, evidence collection and data reconstruction for computing systems and networks. Document preparation for use in the legal system.

**CS-459 Secure Software**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, alternate years

Software security analysis. Construction of secure and re-engineering of insecure software. Secure code and cryptographic best practices. Operating system and compiler security interfaces. Documentation.

**CS-461 Database Systems**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring, alternate years

Database design and implementation, entity-relationship model, relational model, object-oriented model, logical rules, relational algebra and logic, relational query languages, physical data organization, design theory for databases, distributed and Web-based databases.

**CS-465 Information Retrieval and Data Mining**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring, alternate years

Information retrieval and data mining topics, including information storage and retrieval, file structures, precision and recall, probabilistic retrieval, search strategies, automatic classification, automatic text analysis, decision trees, genetic algorithms, nearest neighbor method, and rule induction.

**CS-471 Software Engineering**

**302(4)**

Prerequisites: CS-102

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring, alternate years

Software life cycle including specification, design, coding, testing, and verification of a software project. Stepwise refinement and rapid prototyping. Software portability, reusability and maintenance in the team construction of a large software product. Software quality assurance.

**CS-481 Artificial Intelligence**

**302(4)**

Prerequisites: CS-203

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, alternate years

Types of intelligence, knowledge representation, cognitive models. Goal-based systems, heuristic search and games, learning systems. Language understanding, robotics, theorem proving and deductive systems.

**CS-485 Advanced Game Development**

**302(4)**

Prerequisites: CS-385

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall, alternate years

This course covers essentials of developing a large size game and its delivery. The contents include game agent design and its delivery using a game engine. The game engine will be programmed to deliver GUI elements, sound, terrains, events and thus render the end game.

**CS-541 Web Technology**

**400(4)**

Prerequisites: CS-461 or permission of instructor.

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This concepts, principles, issues and techniques for web technology. The main principles and protocols in internet, the key components in XHTML, JavaScript, PERL, CGI, Java Applets, XML. Web database applications using MySQL and PHP.

**CS-571 Software Requirements Engineering**

**400(4)**

Prerequisites: CS-471

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course is an in-depth investigation of the requirement and specification phase of the software engineering process. Topics include requirement determination, analysis and change techniques, requirement specification modeling with the aid of CASE tools, software quality assurance issues, walkthroughs and inspections. Case studies will also be presented and analyzed.

**CUE-495 Culminating Undergraduate Experience (CUE) Introductory Course**

**0 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: All

This course is the first module of the CUE-495-C/P/R/E thesis options; the remaining required modules include PTA/Proposals, Mid-Project Report, and Written Thesis document. A Kettering students will need to complete this course to fulfill first of four modules required to earn their 4-credit hours for CUE-495-C/P/R/E. The CUE Introductory Course will provide an opportunity to share important information pertaining to the Culminating Undergraduate Experience to all Kettering students approaching their CUE requirement. The course is structured to cover all aspects of the CUE; every week, a different module will be explored, analyzed, and discussed. Topics would include: a detailed review of each CUE option; available guidance to creating and managing a successful timeline to help with issues jeopardizing retention and on-time completion of the CUE; preparation for document submissions throughout the CUE period; usage of KqUest; exploration of vigorous topic discussion; writing workshops; and various resources to aid students. Topics in project management, oral & written communication, professionalism, presentation skills, and personal marketability would also be taught to assist the students' transition from undergraduate students to the professional world, which is a basic goal of the CUE requirement. Students would also benefit greatly through learning and discussing the topics alongside their peers. By the end of the course, students will have greater understanding of the entire CUE process, will possess the knowledge of all the resources available to them, and will be able to confidently begin achieve their CUE. Grading is on a pass/fail (P/F) basis.

**CUE-495C Co-op Thesis**

**4 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Approved

This CUE option is carried out at the student's co-op employment. It is an individual project providing an opportunity for the senior student to apply his or her academic and co-op experience to a realistic problem. This option requires that a student be advised by a faculty member and employer supervisor. The topic selected is to be submitted to Kettering for approval, specifically the faculty member accepting the topic. The student is required to have a tangible artifact such as a comprehensive final written report. This is a two-term project. This new CUE option is offered as one of four options and will normally be registered in one of the student's senior work terms. In addition, participation in an annual Kettering Poster Session and/or Presentation of the thesis is highly encouraged.

**CUE-495E Intra/Entre/Social E-ship Thesis**

**4 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Approved

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE). This option requires that a student be advised by a faculty member as well as at least one qualified committee member (normally Director from the Entrepreneurship Across the University). The topic selected requires approval from CCUE in collaboration with the Director from

Entrepreneurship Across the University. The student is required to have a tangible artifact such as a comprehensive final written report. This is a two-term project. This new CUE option is offered as one of four options and will normally be registered in one of the student's senior work terms. In addition, participation in an annual Kettering Poster Session and/or Presentation of the thesis is highly encouraged.

**CUE-495P Professional Practice Thesis**

**4 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Approved

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE). The project is professional practice in nature, in a group setting and is interdisciplinary providing an opportunity for the senior student to apply his or her academic and co-op experience to a realistic problem at a pre-selected organization. This option requires that a student be advised by a faculty member as well as at least one committee member (normally company liaison). The topic is pre-selected for accepted students pursuing this option. The student is required to have a tangible artifact such as a comprehensive final written report. This is a two-term project. This CUE option is offered as one of four options and will normally be registered in one of the student's senior work terms. In addition, participation in an annual Kettering Poster Session and/or Presentation of the thesis is highly encouraged.

**CUE-495R Research Thesis**

**4 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Approved

This CUE option requires the student to apply and be accepted through the Center for Culminating Undergraduate Experiences (CCUE) in collaboration with the research faculty member. This option requires that a student be advised by a faculty member as well as at least one qualified committee member. The topic is determined by a Kettering faculty member for accepted students pursuing this option and requires topic approval from CCUE. The student is required to have a tangible artifact such as a comprehensive final written report. This is a two-term project. The new CUE option is offered as one of four options and will normally be registered in one of the student's senior work terms. In addition, participation in an annual Kettering Poster Session and/or Presentation of the thesis is highly encouraged.

**ECE-101 MATLAB and C Programming**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

In this course, you will learn the fundamentals of the MATLAB and C programming languages. Special emphasis will be placed on using the tools acquired in this class to solve problems faced by electrical and computer engineers.

**ECON-201 Economic Principles**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course introduces the student to the economic way of thinking. Students learn how individuals, firms, and societies make choices among alternative uses of scarce resources. A survey course, it covers both introductory microeconomics and introductory macroeconomics. The course combines applied theory and policy, and equips the student with the necessary tools to analyze and interpret the market economy.

**ECON-342 Intermediate Microeconomics: Managerial Economics**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course combines microeconomic theory with quantitative analysis to bring out essential features of managerial decision making. Microeconomic topics to be covered include demand and supply, elasticities, consumer behavior, production analysis, costs of production in the short-run and long-run, market structures, pricing practices, government regulation of business, and decision making under uncertainty. The course is application oriented and focuses on the relevance of microeconomic theory to solve business problems of the real world. Regression analysis and optimization methods are used to estimate and optimize microeconomic relations relevant to the revenue and cost structure of the firm such as demand, production, and cost functions. Statistical estimation and inference is facilitated by suitable statistical software.

**ECON-344 Intermediate Macroeconomics: Economic Growth and Fluctuation**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course covers macroeconomic theory and policy at the intermediate level. The determinants of GDP, inflation, unemployment, interest rates, and exchange rates are modeled. The sources of long run economic growth and business cycles are investigated. The effectiveness of government monetary and fiscal policy is evaluated. The course provides students with an understanding of the macroeconomic environment in which business and government decisions are made.

**ECON-346 Introduction to Econometrics**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Bi-Annually

This course introduces the application of statistical tools to economic, business, and social phenomenon. Econometrics is a methodology for applied scientific decision making in the social sciences and business. Students learn how to model, estimate, interpret, and forecast quantitative and qualitative processes using statistical methodology. Topics include regression analysis, simultaneous equations models, and analysis of qualitative data. Students conduct applied research using contemporary statistical software packages.

### **ECON-348 History of Economic Thought**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Bi-Annually

This course analyzes the development of economic thinking by studying the work of preeminent economists and their schools of economic thought. The course helps the student understand contemporary economics and economic issues by studying how past thinkers viewed similar problems. Relevance of the great economic thinkers to contemporary economic issues is emphasized.

### **ECON-350 Comparative Economic Systems**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: All

Capitalism, Socialism, Communism and other "isms" that have occupied the history of mankind have all claimed to hold the key to a more rational social order and a better economic future for mankind. Comparative economic systems set the stage for a comparison of contemporary nation-states in terms of national economic goals, the mechanisms chosen for attaining these goals, and the extent of success in matching means and ends. This course includes pure capitalism as an economic system. This will be followed by mixed economies. Countries to be studied under mixed economies include the U.S., United Kingdom, Germany, and France. In looking at the consequences of socialism as an economic system, countries to be studied include the Russian Federation, Poland, Czech Republic, Hungary, and Romania. Finally, problems of the less developed countries will be analyzed including India, Argentina, Brazil, Mexico, Nigeria, and Guinea. Emphasis will be put on economic decision making processes in all the contemporary economic systems.

### **ECON-352 International Economics**

**400(4)**

Prerequisites: ECON-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course offers the non-major in economics both the micro and macro components of international economics. It covers the theories and policies, as well as the institutional and historical contexts of the increasingly integrated international economy. By the end of the course, the student should be able to intelligently follow international economic issues and their impacts on national economies of various sizes. The student should also be able to explain patterns of a country's trade, analyze trade data of any country, and predict the consequences of alternative trade policies and of movement in the values of major international currencies. Topics covered include absolute and comparative advantage, relative factor endowments, intra-industry trade, tariffs and quotas, factor movements, balance of payments, exchange rates and foreign exchange markets, and international monetary arrangements.

### **EE-210 Circuits I**

**300(3)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H, PHYS-224, PHYS-225

Corequisites: EE-211

Minimum Class Standing: None

Terms Offered: All

This is an introductory course presenting fundamental DC and AC circuit analysis techniques. Topics include circuit variables and elements; resistors, inductors, and capacitors; and sinusoidal steady-state analysis with power calculations. Laboratory experience is designed to re-enforce the fundamental analysis techniques discussed in class.

### **EE-211 Circuits I Laboratory**

**002(1)**

Prerequisites: None

Corequisites: EE-210

Minimum Class Standing: None

Terms Offered: All

This is an introductory laboratory course designed to reinforce the fundamental analysis techniques discussed in EE-210, Circuits I. Topics include: safe use of laboratory equipment and experimental verification of analysis techniques.

### **EE-212 Applied Electrical Circuits**

**310(3)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: MATH-204 or MATH-204H, MECH-231L

Minimum Class Standing: None

Terms Offered: All

Topics include: Ohm's law and Kirchhoff's laws; series and parallel circuits; voltage and current division rules; node-voltage and mesh-current methods; superposition; Thevenin's, and Norton's theorems; first- and second-order R-L-C circuits; steady-state analysis and power calculations for sinusoidally-varying (ac) sources; operational amplifiers; and diodes. This course will not satisfy the requirements of an Electrical or Computer Engineering degree.

**EE-240 Electromagnetic Fields and Applications****400(4)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Basics of electromagnetic fields and applications are studied. Topics include: vector analysis; gradient, divergence, and curl; electrostatic fields; electrostatic boundary-value problems; magnetostatic fields; magnetic circuits; and Maxwell's equations for time-varying fields.

**EE-310 Circuits II****400(4)**

Prerequisites: EE-210, MATH-204 or MATH-204H

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A second course in circuit analysis. Topics include: first-order and second-order transient circuit analysis, the Fourier series, three-phase circuits, resonance, filters, Bode plots and magnetically coupled circuits.

**EE-320 Electronics I****300(3)**

Prerequisites: EE-210, EE-211

Corequisites: EE-321

Minimum Class Standing: None

Terms Offered: All

The basic building blocks used in electronic engineering are studied. Topics include: operational amplifiers; diodes; MOS and bipolar devices; basic transistor amplifier configurations; and MOSFET digital logic circuits.

**EE-321 Electronics I Laboratory****002(1)**

Prerequisites: EE-210, EE-211

Corequisites: EE-320

Minimum Class Standing: None

Terms Offered: All

This is an introductory laboratory course designed to reinforce the topics in EE-320, Electronics I. Experiments include: PSPICE simulation, operational amplifiers; diodes; MOS and bipolar transistor configurations; MOSFET digital circuits.

**EE-322 Applied Power Electronics****302(4)**

Prerequisites: EE-212, MECH-231L

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Basics of power electronic circuits and applications are studied. Topics include operational amplifiers; diodes; bipolar-junction transistors; metal-oxide semiconductor field-effect transistors; insulated-gate bipolar-junction transistors; thyristors; 555-timer; controlled rectifiers; chopper circuits; inverters; and voltage controllers. Emphasis will be placed upon fuel cell related applications. This course will not satisfy the requirements of an Electrical or Computer Engineering degree.

**EE-325 Principles of Microelectronics Processing****400(4)**

Prerequisites: EE-210, EE-211, EE-320, EE-321 or PHYS-342

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This is an introductory course on the principles of semiconductor processing for modern integrated circuits. Topics include a brief review of semiconductor devices and semiconductor circuit families, modern CMOS technology and process flow, crystal growth, semiconductor processing, thin film deposition oxidation, etching, lithography and an introduction to clean room principles. Principles of manufacturing process control and modeling for manufacturability will be presented. Computed simulation will be extensively used where appropriate.

**EE-336 Continuous-Time Signals and Systems****400(4)**

Prerequisites: MATH-204 or MATH-204H, EE-210

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

Introductory continuous-time signals and systems are studied. Topics include: definitions and properties of signals and systems, convolution, differential equations, Laplace transform with applications, Fourier series, and Fourier transform of continuous-time signals with applications.

**EE-338 Discrete-Time Signals and Systems****400(4)**

Prerequisites: MATH-204 or MATH-204H, EE-210

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

Introductory discrete-time signals and systems are studied. Topics include: definitions and properties of signals and systems, sampling, convolution, difference equations, Z transform with applications, and the Fourier transform of discrete-time signals with applications.

**EE-340 Electromagnetic Wave Propagation****400(4)**

Prerequisites: EE-240

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Advanced concepts of electromagnetic fields are studied. Topics include: propagation of uniform plane waves in various material media; transmission line analysis; electromagnetic wave propagation in waveguides; and antennas.

### **EE-342 Electrical Machines**

**302(4)**

Prerequisites: EE-210, EE-211, EE-240

Corequisites: EE-310

Minimum Class Standing: None

Terms Offered: Winter, Spring

Operating principles and design concepts of various types of electrical machines are studied. Topics include: magnetic circuits, single-phase and three-phase transformers; dc motors and generators; three-phase alternators; synchronous motors, induction motors and single-phase motors.

### **EE-344 Fundamentals of Power Systems**

**302(4)**

Prerequisites: EE-210, EE-211

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Basic structure of electrical power systems and characteristics of power transmission lines, transformers and generators are studied. Topics include: representation of power systems; symmetrical three-phase fault analysis; symmetrical components; unsymmetrical fault computations; and network analyzers.

### **EE-346 High Voltage Generation and Measurement Techniques**

**302(4)**

Prerequisites: EE-210, EE-211, EE-240

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Insulation overvoltage-tests are studied. Topics include: generation of high, direct, alternating, and impulse voltages; voltage multiplier circuits; resonant test circuits; resistive, capacitive and mixed high-voltage dividers; sphere gaps; electrostatic voltmeters, Kerr Cell; and electrostatic coupling, interference, and grounding and safety.

### **EE-348 Electromagnetic Compatibility**

**400(4)**

Prerequisites: EE-210, EE-240

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Issues involved in designing electrical and electronic systems to achieve electromagnetic compatibility are studied. Topics include: interference sources; government regulations limiting conducted and radiated emissions; electric and magnetic field noise coupling; grounding; filtering; shielding; electrostatic discharge; spectral analysis of electromagnetic interference; design methods for minimizing radiated emissions from digital circuits; and measurements of system emissions and susceptibility.

### **EE-420 Electronics II**

**302(4)**

Prerequisites: EE-310, EE-320, EE-321

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Advanced concepts of electronic engineering are studied. Topics include: nonlinear circuits; active filters; differential and multistage amplifiers; pulse and switching circuits; integrated circuits; and electronic system design.

### **EE-424 Power Electronics and Applications**

**302(4)**

Prerequisites: EE-310, EE-320, EE-321

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Speed control and dynamic representation of electric motors are studied. Topics include: characteristics of diodes; diacs; thyristors; and MOSFET's; thyristor gate firing circuits; operating principles of AC/DC, DC/DC and DC/AC converter circuits; and computer-aided state-space analysis of the dynamic response of the converter circuits.

### **EE-427 Semiconductor Device Fundamentals**

**400(4)**

Prerequisites: EE-210, EE-320

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Basic semiconductor theory for solid-state devices, diode theory, and applications of theory for transistors are studied. Topics include: energy bands, carrier statistics, equilibrium carrier concentrations, carrier transport, electrostatic devices, diode I-V characteristics, optical device applications, microwave device effects, and BJT, JFET, MESFET and MOSFET transistor models. Note: A student cannot receive credit for both EE-426 and EE-427.

**EE-430 Communication Systems****400(4)**

Prerequisites: EE-310, EE-320, EE-336 or EE-338, MATH-408

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

The study of methods used in electronic communication systems. Topics include: Fourier Transforms; analysis of distortion over a communication channel; autocorrelation of deterministic and random signals; energy and power spectral density; amplitude modulation; frequency modulation; phase modulation; digital line coding and modulation; communication circuitry.

**EE-432 Feedback Control Systems****302(4)**

Prerequisites: EE-310, EE-320, EE-321, EE-336

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Time and frequency domain representations of control systems are studied. Topics include: stability criteria; root locus methods; frequency response techniques, s-plane design methods. Design and evaluation of control systems are supplemented with computer aided control system design software.

**EE-434 Digital Signal Processing****302(4)**

Prerequisites: ECE-101, EE-338

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Basic principles, design and applications of digital signal processing systems are presented. Topics include: review of discrete-time signals and systems, the z-transform, discrete-time Fourier analysis, the Discrete Fourier Transform, the Fast Fourier Transform, digital filter structures, FIR filters, and IIR filters. This course includes extensive use of MATLAB and experimental design projects using real-time signal processors.

**EE-444 Computational Methods in Power Systems****400(4)**

Prerequisites: EE-344

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Matrix analysis of power system networks is studied. Topics include: power flow study of large scale interconnected power systems using Gauss-Seidel and Newton-Raphson methods; computer-aided short circuit analysis of large systems; economic operation of power networks; transient stability analysis; overvoltage calculations; and fundamentals of power system protection.

**EE-490 Senior Electrical Engineering Design Project****204(4)**

Prerequisites: CE-210, CE-320, EE-210, EE-211, EE-240, EE-310, EE-320, EE-321, EE-336, EE-338

Corequisites: None

Minimum Class Standing: Senior Thesis Standing

Terms Offered: Summer, Fall

Students will design, implement, document, and present a device or system as a significant capstone project. The project will emphasize electrical engineering, but will be multidisciplinary.

**EE-524 Fuel Cell System Integration and Packaging****400(4)**

Prerequisites: EE-322 or EE-424, and MECH-325 or MECH- 420

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course will focus on the conversion, management, and control of electric power produced by 10kw-200kw fuel cells for both mobile and stationary applications. Special considerations will be given to packaging of fuel cells and motor drive circuits, thermal management and heat dissipation, bi-directional energy flow through the electric machines and motor drives, ultracapacitor technology, NiMH batteries, and control of high power motors. Emphasis includes design and packaging of high temperature motor drives for processing power generated by fuel cells and for conditioning power generated by these same electric motors during regenerative braking. Technical issues that are addressed include: control of the motor drives; heat removal from the fuel cell, motor drive semiconductor switches and magnetics; behavior of power semiconductor switches at elevated temperature; thermal design and analysis of the electronics package; noise generation in control systems by electric power transients and modeling of the power system. This course is presented from the perspective of the systems engineers that are responsible for the overall system design and integration of the power electronics, the fuel cell, the heat removal technology, and the electric machines to make a system that has an acceptable lifetime in a hostile thermal environment.

**EE-526 Advanced Power Electronics****402(4)**

Prerequisites: Course work or work experience in power electronics or electric vehicle drive trains

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This is an advanced class in power electronics. State variable modeling of DC-DC converters: buck, boost/buck-boost/Cuk; state variable modeling of converter topologies: floating interleaved dual boost, floating double-interleaved dual boost, floating double boost double stage boost, and isolated full IH-bridge; converter control system design based on state variable models; circuits for soft switching in inverters and converters; single phase inverter design; three phase, six-step inverter design; multilevel inverter design; Pulse Width Modulation (PWM): SPWM, HEPWM, SVPWM; resonant converters: series, parallel, series-parallel; wireless battery charging.

**EE-528 Power Semiconductors****302(4)**

Prerequisites: Course work or work experience in power electronics or electric vehicle drive trains

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

The study of power semiconductors. Topics include: semiconductor physics review; diffusion and drift currents; reverse recovery of diodes; principles of operation of semiconductor power switches; snubbers and diode protection and isolated gate drive circuits for MOSFETs and IGBTs; static and dynamic power losses in power switch turn-on and turn-off; equivalent circuit models for IGBTs; effects of temperature on electrical operation of power switches; semiconductor switch cooling methods and electrical representation of steady state and transient cooling models of power semiconductors; advanced semiconductor power switches: SiC and GaN; reliability models of power semiconductors: thermal cycling/thermal expansion/failure modes; commercial semiconductor power modules and devices.

**EE-530 Digital Control Systems****302(4)**

Prerequisites: EE-432

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Control of continuous-time processes using computer-based controllers is studied. Topics include: design of control algorithms for implementation of digital computers; modeling of discrete-time systems; application of z-transforms; stability analysis; root locus analysis; controller design via conventional techniques; state-space analysis and modeling; and design of control systems using state-space methods. Implementation of real-time digital controllers is performed in the lab.

**EE-582 Robot Dynamics and Control****400(4)**

Prerequisites: None

Corequisites: EE-432

Minimum Class Standing: None

Terms Offered: Summer, Fall

Principles of robot analysis, design, and operation are presented. Topics include: coordinate systems, kinematics and robot dynamics; feedback, feedforward, and adaptive methods for arm control; vision and intelligence; and mobile robots.

**EP-235 Computers in Physics****204(4)**

Prerequisites: PHYS-224, PHYS-225, and permission of instructor

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course exposes applied physics to students to the multiple ways computers are used by professionals in industry, academia, and government laboratories. Problems in physics will be solved through analytical or symbolic software tools, numerical approaches implemented in spreadsheets and basic scripts written in a structured style, and experimental tools for control and data acquisition. This combination of symbolic, numerical and experimental work will give students a practical toolbox of techniques to solve new problems and meet challenges in upper level classes, graduate school, and/or postgraduate positions.

**EP-446 Solid State Physics****400(4)**

Prerequisites: MATH-204 or MATH-204H, PHYS-362

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter (odd years), Spring (even years)

This course covers advanced topics in physics of solids such as crystal lattices, reciprocal lattice vectors and momentum space, concept of the Brillouin zones, elastic waves in crystals, phonons, phonon heat capacity, density of states, free electron gas model, energy band gap and Bloch functions, Kronig-Penney model for periodic well and reciprocal space, effective mass, Fermi surfaces, semiconductors & semiconductor devices – pn junctions, LEDs and Lasers.

**EP-485 Acoustic Testing and Modeling****204(4)**

Prerequisites: MATH-204 or MATH-204H, PHYS-302

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course combines testing and measurement in the Acoustics Laboratory, modeling approaches including the finite element method, and exposure to textbook and journal literature to explore basic phenomena in acoustics. Each time the course is offered, students and the instructor will select three modules from a larger set, so that the course may be tailored to meet the needs and interests of students and faculty. Module topics include acoustics oscillators, structural vibration, source models, three-dimensional wave propagation, impedance and intensity, and transducers. Additional modules may be offered. Students in this course will collaborate to develop understanding through lab work, modeling, and theory. Each module will culminate in a presentation.

**ESL-097 English as a Second Language I****400(4)**

Prerequisites: Placement exam

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed



This course is the first in a three-part sequence providing instruction and practice in speaking, reading, listening, and writing in English for students whose first language is not English. It focuses on grammar, vocabulary, and syntax of the English language. A placement exam at the end of this course will determine placement in the next ESL class or in COMM-101. As a basic skills course, it cannot substitute for any of the general education courses required of all students. Credits for ESL-097 do not apply to degree requirements.

### **ESL-098 English as a Second Language II**

**400(4)**

Prerequisites: ESL-097 or placement exam

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the second in a three-part sequence providing instruction and practice in speaking, reading, listening, and writing in English for students whose first language is not English. It develops the grammar, vocabulary, and syntax of the English language based on the foundation established in ESL-097. A placement exam at the end of this course will determine placement in the next ESL class or in COMM-101. As a basic skills course, it cannot substitute for any of the general education courses required of all students. Credits for ESL-098 do not apply to degree requirements.

### **ESL-099 English as a Second Language III**

**400(4)**

Prerequisites: ESL-098 or placement exam

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the third in a three-part sequence providing instruction and practice in speaking, reading, listening, and writing in English for students whose first language is not English. It develops the grammar, vocabulary, and syntax of the English language based on the foundation established in ESL-097 and ESL-098. A placement exam at the end of this course will determine placement in COMM-101 or repetition of ESL-099. As a basic skills course, it cannot substitute for any of the general education courses required of all students. Credits for ESL-099 do not apply to degree requirements.

### **FINC-310 Financial Markets**

**400(4)**

Prerequisites: ACCT-212

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

The purpose of this course is to provide students with (1) the theoretical models that underlie the values of stocks and bonds; (2) an understanding of the financial markets where securities are traded and (3) investment alternatives such as mutual funds, options and commodities. The importance of these topics to both the firm and the individual investor will be stressed.

### **FINC-311 Financial Management**

**400(4)**

Prerequisites: ACCT-212 or ACCT-315 or MATH-350

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course identifies and discusses the role financial management plays in the successful operation of a business enterprise. Subject areas include the capital asset pricing model, bond and stock valuation, and capital structure management. Ethical and legal issues facing financial managers are emphasized by the daily use of The Wall Street Journal.

### **FINC-411 Investments**

**400(4)**

Prerequisites: FINC-311

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

This course provides an introduction into the fundamentals of investment analysis. A mixture of description and theory provides an overview into security markets, sources of investment information, investment opportunities, and the classic process of analyzing and valuing securities. The concept of portfolio theory in terms of risk and return is also examined.

### **FYE-101 First Year Foundations**

**100(1)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course will provide critical information on personal, academic and professional development for first-year students. Class discussions will support student engagement in the Kettering community, help make important connections for students to develop a sense of self-governance, and set a foundation for both critical thinking and reflective learning mindset. Students will learn to interact in the academic and cooperative work environments successfully. Mentoring and interaction with the instructors will provide support and guidance for students to be fully integrated into Kettering University. Discussions and assignments will enhance student transition and acclimation to Kettering University.

### **GER-101 Beginning German I**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the first in a three-part sequence providing an introduction to speaking, reading, listening and writing German. To that end, its focus is on the grammar, vocabulary, and syntax of the German language. Students are eligible to take this course only if they have less than one year of high school German, or less than one term of college German or by consent of the Head of the Department of Liberal Studies. A basic skills course, it counts for free elective credit and cannot substitute for any of the general education courses required of all students.

### **GER-102 Beginning German II**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the second in a three-part sequence providing an introduction to speaking, reading, and writing German. It develops the grammar, vocabulary, and syntax of the German language based on the foundation established in Beginning German I. Students are eligible to take this course only if they have less than two years of high school German, or less than two terms of college German or by consent of the Head of the Department of Liberal Studies. A basic skills course, it counts for free elective credit and cannot substitute for any of the general education courses required of all students.

### **GER-103 Beginning German III**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course is the third in a three-part sequence providing an introduction to speaking, reading, and writing German. It develops the grammar, vocabulary, and syntax of the German language based on the foundation established in Beginning German I and II. Students are eligible to take this course only if they have less than three years of high school German, or less than three terms of college German or by consent of the Head of the Department of Liberal Studies. A basic skills course, it counts for free elective credit and cannot substitute for any of the general education courses required of all students.

### **HIST-306 International Relations**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

A study of the central issues and problems in the history of modern international relations. This course will explore such issues as the connection between the First World War and the Second World War, the impact of the policies of great powers on conflicts in the non-western world, and the causes and consequences of the Cold War. This course will also examine the rise of international organization, the expansion of Western power, and the acceleration of global interdependence.

### **HIST-308 America and the World**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

A study of the central issues and problems in the history of America's relations with the larger world. This course will examine such topics as American independence and expansion, the Civil War and the "new empire", the Spanish-American War, American involvement in the First World War, U.S. foreign relations in the interwar period, American involvement in the Second World War in the Pacific and Europe, The Cold War, the impact of the U.S. in Latin America, Asia and Africa, and American foreign relations since 1989.

### **HIST-310 Imperialism**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

A broad comparative study of the central issues and the problems in the history of modern imperialism. This course will encompass historical writing, novels, poetry, film, and primary documents to examine such themes as the meaning of "imperialism;" colonial rule and administration; the technology and economics of empire; the tensions between cultural diversity and political unity; the impact of imperialism on art, architecture and society; decolonization; and the legacies of imperialism for contemporary Africa, Asia, the Americas, and Europe.

### **HIST-312 History of Science**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course explores selected topics, figures, and ideas in the history of science. Attention is paid to transitions between patterns of scientific thinking; the social, political, and religious dimensions of scientific theory and practice; the relationship between science and technology; and the impact of modern science on understandings of human purpose and identity. (Social Science Credit.)

### **HIST-314 Human Conflict & Conflict Resolution**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

A broad comparative study of the central issues and problems in the history of human conflict and of conflict resolution. This course will encompass historical writing, novels, poetry, film and primary documents to examine conflicts involving different states and peoples in different historical eras. Students will explore how and why states have resorted to violence, why people fought and died for those states, and how the violence finally ended.

### **HIST-316 History of the Atlantic World**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course examines the creation and development of the Atlantic world from the sixteenth to the twentieth century. Transcending the constraints of national histories and modern state boundaries, the course explores the connections among the various parts of the Atlantic intercontinental world and the important historical forces and processes that transformed it. Through investigations of the experiences of four continents, this course traces the evolution of new institutions in the Americas; addresses issues of ethnic, racial, and religious differences and interactions; and attempts to provide new framework for understanding human diversity.

### **HIST-320 Modern Middle East**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course surveys the history of the Middle East from World War I to the Gulf War of 1991. It focuses on the Arabic-speaking areas of the former Ottoman empire, Turkey, Iran, and Israel. Thematically, the course explores major themes in Middle East history; the rise of nationalism and formation of nation-states; economic development strategies of the new states and formation of new social classes; the impact of Israeli and Palestinian nationalism and conflicts; oil and politics; the Islamic Revolution in Iran, and the Gulf War. The course also examines the impact of outside powers on the region; problems of political, economic, and cultural decolonization; and efforts to reassert Islamic identity in an era of tightening globalization. Considerable attention will be devoted to the region since 1945 and to the problems and promises of the present day.

### **HIST-322 Africa in the World Economy**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

The course examines Africa's involvement in the changing world economy and its role in the contemporary world. Its goal is to provide students a framework for understanding Africa's contemporary economic challenges and opportunities. It begins by examining the political, social and economic history of the continent since independence, focusing on how the lack of visible material and social progress in the post-independence period framed popular perceptions about Africa. It also explores the role of external players and ideas and the nature of local initiatives and responses in shaping Africa's place in the world economy.

### **HMGH-409 Healthcare Management**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

In this course students gain a broad understanding of organizational, financial and policy issues in healthcare delivery systems in the US. Students will apply core business skills and knowledge of healthcare unique functional areas in analyzing healthcare case studies. Students will critically evaluate healthcare issues and policies and their effect on healthcare system performance.

### **HUMN-201 Introduction to the Humanities**

**400(4)**

Prerequisites: COMM-101

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

The humanities are disciplines focused on the study of literature, philosophy, and the arts. This course is designed to introduce students to the humanities by the examination of selected works in drama, fiction, poetry, philosophy, and the fine arts. Formal graded writing assignments will be integrated into the course.

### **HUMN-360 Technology and Culture**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As needed

A study of the deep relationship between culture and technology, drawing on themes in literature, politics, communication, ecology, and ethics. Students study the role of technology in our culture, as well as how we think about technology and how technology changes how (and what) we think.

### **HUMN-362 Global Film Cultures**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As needed

A study of select cinematic traditions from around the world, this course approaches cinema as an artistic form that is at once global, and historically and culturally specific. It explores differences between films produced in a number of different contexts and time periods in terms of their style, political content, and industrial contexts.

### **HUMN-364 Bollywood Film**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As needed

This course charts the history of India's mainstream Hindi-language film industry, Bollywood, through a study of this cinema's formal conventions and prominent themes. A wide variety of films – films about romance, social protest, and diaspora, among other issues – will be analyzed alongside key social and political events in India's history to establish the importance of cinema to nation.

### **HUMN-365 Art & Nature in Early Industrial England**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As needed

In this interdisciplinary course we explore, from a humanities perspective, questions regarding art and nature within the social, political, and technical contexts of the period of pre-turbine steam power in England (1770 to 1900). Students interpret paintings and works of poetry and fiction, paying special attention to how those works reflect, and have a role in shaping, ideas and attitudes regarding industrialization and the natural world. In doing so, they develop a sensitivity to the hardships and struggles of people who are disempowered or marginalized within a stratified, industrial society.

### **IME-100 Interdisciplinary Design and Manufacturing**

**204(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This introductory class exposes students to basic design principles, the materials of manufacture, their structure and properties, and methods of processing them into everyday products. A laboratory experience provides hands-on experience in many of these processes. A second laboratory provides experience in mechanical design and electrical and computer manufacturing.

### **IME-211 Algorithms and Computer Programming**

**302(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This course introduces students to algorithm development and a structured programming language using VB (Visual Basic) programming language. Students use procedural and event-driven programming methodologies to design, develop, and test computer programs to solve engineering, science, and financial problems. The course incorporates VB's ActiveX controls. VB programs will be interfaced with Excel spreadsheet and Access Database using DDE (Dynamic Data Exchange) method.

### **IME-251 Engineering Economics**

**400(4)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

Introductory course on economic and financial analysis to assist engineering managers in making fiscally sound decisions. Topics include financial measures such as Return On Investment, Break-even Analysis, Replacement Analysis, Depreciation and Taxes, and Multiple-criteria Decision Making.

### **IME-301 Engineering Materials**

**302(4)**

Prerequisites: CHEM-135, CHEM-136, IME-100, MECH-210

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: All

Students will learn how to specify suitable materials for a given application based on mechanical properties determined from experimental data. The selection of alternative metals, ceramics, polymers and composites, and the management of materials properties to satisfy design requirements will be discussed. Students will see how processing changes structure and how this change in structure affects the mechanical properties of materials. Students will be expected to communicate their findings in oral, written and visual form.

### **IME-321 Operations Research I – Deterministic Models**

**302(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Deterministic Systems Optimization; Review of linear algebra, linear programming, sensitivity analysis, transportation problems, assignment problems, transshipment problems, network models, integer programming, and dynamic programming.

**IME-332 Engineering Statistics I – Statistical Inference and Regression 400(4)**

Prerequisites: MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: Summer, Fall

Introduction to Applied Engineering Statistics. Basic concepts in statistics, exploratory data analysis, different sampling methods, descriptive statistics, inferential statistics for one and two population cases, goodness of fit tests, regression analysis and non-parametric statistics. Statistical software such as Minitab is used throughout the course.

**IME-333 Engineering Statistics II – Design of Experiments 400(4)**

Prerequisites: IME-332 or MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

Advanced topics in Applied Engineering Statistics. Introduction to linear regression analysis, simple linear models, multiple linear models, residual analysis, indicator variables, variable selection process, ANOVA, introduction to DOE, basic designs, factorial designs, fractional factorial designs, blocking, Taguchi designs, and response surface methodology. Extensive use of statistical software such as Minitab throughout the course.

**IME-361 Lean Work Design 302(4)**

Prerequisites: MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

The design and implementation of a production system is used to provide a fundamental understanding of work design and performance improvement concepts, tools, and techniques. Topics covered include applied anthropometry, charting techniques, work methods and waste analysis, performance measurements and learning curves, workplace organization and visual controls, human factors, and physiological stress.

**IME-403 Computer Numerical Control Machining 302(4)**

Prerequisites: IME-100, IME-301

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

This course introduces the fundamentals of computer numerical control (CNC) programming and computer-aided manufacturing (CAM). The fundamental theoretical and operational concepts of machining are also presented. The course focuses on the programming of cutting operations; tool materials, selection, and uses. Significant topics include: G-code programming, Introduction to CAM software, Taylor's tool life model, Criteria for tool selection, and the Orthogonal Cutting Model. Laboratories use CNC machine tools for programming and cutting, and are designed to illustrate theoretical concepts and methods for solving practical engineering machining problems.

**IME-404 Sheet Metal Forming 302(4)**

Prerequisites: IME-301

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

This course demonstrates the need for thinking one's way through manufacturing situations rather than calculating. Special material properties important to forming are developed followed by a discussion of strain generation and measurement techniques including Circle Grid Analysis and Forming Limit Diagrams. The fabricating processes of shearing, bending, drawing, and stretching are investigated thoroughly. Special forming processes and simulation testing are also discussed. The interaction of tooling, presses, and lubrication completes the study of sheet metal forming. Laboratory experiences on production-grade presses complement the lecture.

**IME-405 Casting Processes 204(4)**

Prerequisites: IME-301

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring, of even numbered years.

Green sand casting, lost foam casting, permanent mold casting and die casting are discussed. The interrelationships between part design, solidification mode, casting process parameters and the resulting microstructure and properties are examined.

**IME-408 Industrial Robotics 302(4)**

Prerequisites: IME-100, MECH-100 or approval of instructor

Corequisites: None

Minimum Class Standing: JR2

Terms offered: Fall (every year) and Winter (even years)

The basic concepts of robot theory and applications are presented. Vision systems and virtual robotics are interfaced with diverse real environments including robotic surgery. Justification of investment and benefits are emphasized for LEAN operations. Computer communication is crafted for equipment integration. Topics include physical robot components and peripherals, integral function of robot and

equipment in workcells, safety, end-effector design, work-holding, path planning, motion control, and programming languages. Student may earn an industry-sourced certificate in Robotics. Examples, work problems and Labs are drawn from manufacturing and healthcare systems.

**IME-409 Computer Integrated Manufacturing**

**302(4)**

Prerequisites: MECH-100

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Summer, Fall

Study the current status of CIM, with definition, case studies, citing obstacles and future trends and development. Some key components of CIM and hierarchy of operation in a manufacturing facility are studied and correlated. They include CAD-CAM link, numerical control, automation, production and manufacturing control, control through proper communication and computer supervisory control, robotics control, process planning. Short summary of planning, implementation, and managing of a CIM environment will also be covered. The students will conduct experiments and projects on creating a CIM environment using computer supervisory control.

**IME-412 Applied Control Systems Design**

**302(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Winter, Spring

An introductory course designed to introduce students to the various computer controlled systems used for data collection, analysis and reporting. Various hardware, software, sensors, and human resources required to implement effective control systems will be studied. Students will be engaged in hands-on laboratory exercises requiring them to configure and write programs to solve various assigned problems through individual and/or group efforts. In addition, students will be given assignments to be completed outside of class. By the end of the course the student should have good understanding effective use of computerized control systems.

**IME-422 Simulation**

**400(4)**

Prerequisites: MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

In this course, the student will develop an understanding and need for simulation in practice. The course will focus on basic and advanced concepts in simulation including comparing the simulated results with analytical results, and successfully develop simulation models useful in production/manufacturing, supply chains, transportation, and other areas related to Industrial and Manufacturing Engineering. Simulation package such as ARENA will be integrated and used throughout the course.

**IME-423 Operation Research II – Stochastic Models**

**400(4)**

Prerequisites: IME-321

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Summer, Fall

Stochastic models in operations research; Review of basic probability, discrete time Markov chains; continuous time Markov chains; discrete and continuous phase type distributions; birth-and-death processes; elementary queuing models involving Poisson arrivals and exponential service times; advance queuing models; basic concepts in simulation and simulation of various processes.

**IME-452 Designing Value in the Supply Chain**

**310(4)**

Prerequisites: MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: IE Junior or non-IE SR

Terms Offered: Winter, Spring

Students gain an understanding of the decision-making tools necessary to design value in the global supply chain from concept to customer. Quantitative methods are employed to aid the decision-making process of demand forecasting and enterprise planning for the purpose of increased profit and value to stakeholders. Basic concepts in strategy, forecasting, demand planning, inventory control and value stream mapping will be taught and utilized to enable the decision-making process to be based on quantitative metrics.

**IME-453 Tools for Managing the Supply Chain**

**400(4)**

Prerequisites: IME-452

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

Students gain an understanding of the decision-making process required to design and manage the global supply chain. Building on the fundamental concepts from the introductory course, complexities of uncertain demand patterns and multiple product planning will enable quantitative decision-making by engineering managers. Contemporary topics and tools will be covered.

**IME-454 Senior Design Project**

**204(4)**

Prerequisites: Final term on campus or Department Head approval

Corequisites: None

Minimum Class Standing: Final Term on Campus

Terms Offered: All

This course provides the student with the challenge of integrating and synthesizing general engineering knowledge particularly in industrial and manufacturing disciplines, into creatively solving real-world, open-ended problems in a team setting. This requires defining a project work plan,

developing the problem statement, objectives and evaluation criteria; data collection; selection of appropriate analytical and production techniques; developing and integrating recommendations; justifications of recommended course of action; and written and oral presentation of results. The project could involve production systems or product design where the planning can extend to product realization.

**IME-456 Engineering for Healthcare Systems**

**310(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This course examines the technical structure of the healthcare delivery system and the role that industrial and systems engineering (ISE) plays in its design and improvement. Included will be how healthcare systems work in hospitals, medical offices, clinics and other healthcare organizations. Traditional ISE methods for improving quality, patient safety, and employee productivity and satisfaction will be presented within a systematic application of value chain engineering designed to produce lean processes.

**IME-462 Ergonomics**

**302(4)**

Prerequisites: MATH-310 or MATH-408, and MECH-210

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Fundamentals of work design are built upon to ground the student in human factors and ergonomics of work design. Topics include applied job design, manual material handling, cumulative trauma disorders, hand tool design, design of controls and displays, and ergonomic and human factors of product design.

**IME-471 Quality Assurance**

**400(4)**

Prerequisites: IME-332 or MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course covers the basics of modern methods of quality control and improvement that are used in the manufacturing and service industries. It includes quality philosophy and fundamentals, statistical methods of quality improvement, concept of variation and its reduction, statistical process control, acceptance sampling, designed experiments in quality improvements, and quality in the service sector. Deming's quality concepts will also be discussed.

**IME-474 Design for Manufacture and Assembly**

**302(4)**

Prerequisites: IME-301

Corequisites: None

Minimum Class Standing: SR2

Terms Offered: Summer, Fall

This course develops skills needed to prepare a product functional specification for an existing product, at the product subfunctional group and individual part levels. The development and application of a function structure diagram is developed for a product. Creative concepts generation tools are learned to generate alternate mechanisms to generate the functions of a product. The PUGH concept selection method is utilized to select top ideas in each subfunctional group. New product level concepts are generated by combining the best concepts in each subfunctional group. The BDI Design for Assembly method is applied to existing products to determine a path for part consolidation. The DFA Redesign Concept Matrix is used to create novel assembly concepts. Concepts in the course are taught through lecture and facilitated practicum.

**IME476 Lean Six Sigma**

**310(4)**

Prerequisites: IME-332 or MATH-310 or MATH-408

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Winter, Spring.

This course examines techniques to maximize production efficiency and to maintain control over each step in the process. The structured problem-solving methodology DMAIC (Define-Measure-Analyze-Improve-Control) will provide the framework for the course.

**IME-563 Safety and Human Factors**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR standing in IE Program

Terms Offered: Winter, Spring

Discussion of the relationship between traditional safety engineering and human factors or ergonomics. Examination of man-machine interfaces relative to people's capabilities and limitations. Application of accident modeling or investigation and hazard analysis or control techniques. Introduction to mandatory and voluntary specification and performance regulations, standards, and guidelines.

**IME-564 Ethics and Practice of Engineering**

**310(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: SR Standing in Industrial Engineering program

Terms Offered: Summer, Fall

The course deals with the professional and ethical considerations of an engineer in contemporary society. Discussions include: the codes of ethics for engineers, case studies on conflict of interest, team, engineering/management responsibilities, environmental considerations and professional registration. The format is video lectures with a live weekly discussion.

**IME-572 Introduction to Reliability & Maintainability**

**400(4)**

Prerequisites: MATH-408

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course is to provide basic knowledge and skills of reliability techniques that can be used by practicing engineers. The primary emphasis is on the problem of quantifying reliability in product design and testing. The topics include reliability definition and concepts, life testing and data analysis, system reliability models, and repairable systems reliability. Accelerated life testing will also be discussed.

**IME-573 Advanced Quality Assurance**

**400(4)**

Prerequisites: IME-333, IME-471

Corequisites: None

Minimum Class Standing: BS

Terms Offered: Summer, Fall

This course covers the advanced topics of modern methods of quality control and improvement that are used in the manufacturing and service industries. It includes statistical methods of quality improvement, concept of variation and its reduction, statistical process control, designed experiments in quality improvement, and quality in the service sector. Taguchi and Deming's quality concepts will also be discussed.

**IME-575 Failure Analysis**

**204(4)**

Prerequisites: IME-301

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

An engineering materials analysis course emphasizing the interaction of materials and processing as they relate to product failure. Topic coverage includes fracture path analysis, fracture mode, brittle and ductile behavior, fracture mechanics, physical chemistry, corrosion, and material process analysis. This course requires a laboratory analysis project.

**IME-583 Industrial Engineering Concepts**

**310(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: Non-IE SR or Graduate student with non-IE undergraduate degree

Terms Offered: Fall, Spring

This course introduces topics pertinent to the practice and management of the profession of industrial engineering. The topics covered may include: Activity-based Costing and Quoting (ABC/Q), Material Requirements Planning (MRP), Decision Making, Ergonomics, Forecasting and Scheduling Techniques, Simulation and its use in Production Planning and Control, Inventory Techniques, Quality and Improvement, Supply Chain Management, and Value Stream Mapping.

**INEN-101 Innovation and Entrepreneurship Mindset**

**102(2)**

Prerequisites: Good academic standing

Corequisites: None

Minimum Class Standing: FR

Terms Offered: Winter, Spring

This introductory multidisciplinary course is designed to introduce freshmen to problem-based learning that combines science, engineering, innovation, and entrepreneurship principles with a focus on an important societal need. Upon completion of this course, the student will be able to:

- Demonstrate hands-on implementation of engineering design processes in a multidisciplinary team environment
- Utilize engineering design processes and perform preliminary research
- Develop innovative solutions to address relevant societal needs
- Develop and clearly state a value proposition for commercial application of their solution
- Recognize concepts of entrepreneurship and intrapreneurship
- Effectively communicate their ideas to an audience

**INEN-201 Innovation and Entrepreneurship Case Studies**

**200(2)**

Prerequisites: COMM-101 and either INEN-101 or program director approval

Corequisites: Participation in Kettering Entrepreneur Society

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This seminar-style course is designed to inspire the students about innovative idea generation and new venture creation. Students will read and discuss relevant books about creativity, entrepreneurship, and opportunity recognition. Students will be required to participate in Kettering Entrepreneur Society discussions and networking. Upon completion of this course, the students will be able to:

- Recognize the pathway from innovation to entrepreneurship and from invention to commercialization
- Recognize the importance of team building and conflict resolution in new venture creation
- Identify the relevance of entrepreneurial mindset to intrapreneurship

**INEN-202 Innovative Idea Development**

**200(2)**

Prerequisites: INEN-201 or program director approval

Corequisites: Participation in Kettering Entrepreneur Society

Minimum Class Standing: SO



Terms Offered: Winter, Spring

This course is designed to engage the students in acquiring the skills for recognizing opportunities for innovation. Students will learn to develop ideas into marketable concepts based on real customer needs. If needed, the students will be provided access to space and equipment for proof-of-concept development. Students will be required to participate in Kettering Entrepreneur Society discussions and networking. Upon completion of this course, the students will be able to:

- Employ proven methodologies for opportunity recognition within or outside an organization
- Develop well defined ideas for practicing innovation and entrepreneurship/intrapreneurship in the following years of their academic program.
- Formulate and describe the value proposition of their ideas for an appropriate market segment or organization

#### **INEN-401 Business Model Development**

**004(2)**

Prerequisites: INEN-202 or program director approval

Corequisites: BUSN-372 and leadership role in Kettering Entrepreneur Society or mentorship role in INEN-101

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This course is designed to coach the students in business model development and market analysis. The initial steps to creating a business plan and raising financial capital to launch a venture will be discussed. If needed, the students will be provided access to space and equipment for proof-of-concept development. Students will be required to participate in Kettering Entrepreneur Society discussions and networking. Upon completion of this course, the students will be able to:

- Develop an appropriate business model for the ideas they formulated previously
- Understand the importance of scalability and sustainability in a business model
- Conduct market analysis
- Recognize the basics of business plan and its relationship with business model
- Recognize application of business model and business plan development to intrapreneurship

#### **INEN-402 Prototyping and Commercialization**

**004(2)**

Prerequisites: INEN-401 or program director approval

Corequisites: BUSN-373 and leadership role in Kettering Entrepreneur Society or mentorship role in INEN-101

Minimum Class Standing: SR

Terms Offered: Winter, Spring

This course is designed to engage the students in the development of a prototype and commercialization plan for their ideas. Students will be required to participate in Kettering Entrepreneur Society discussions and networking. Upon completion of this course, the students will be able to:

- Construct a detailed business plan for adoption and commercialization of their ideas within or outside an organization
- Develop effective value proposition for a specific market segment
- Demonstrate use of engineering tools such as simulation, prototyping and manufacturing processes to advance an innovative idea

#### **KETT-540 Environmentally Conscious Design**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This is a multi-disciplinary course that provides students with the perspective and skills (economic, managerial, ethical, scientific, and engineering) needed to critically examine environmental issues in product design and manufacturing and to arrive at viable solutions to these problems. Emphasis is placed on solutions that reduce costs and improve environmental performance. The course is open to engineering, science and management undergraduate and graduate students, and focuses on examples of environmental issues related to the goods and services produced by Kettering University's industrial co-operative education partners. The course uses case studies to introduce new concepts to students which are then reinforced through group discussion, guest speakers, laboratory experiences and other activities.

#### **LANG-297 Language Transfer Course**

**4-12 credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: None - Transfer only

This course records credit for students transferring to Kettering University. Students may repeat the course up to three times for a maximum of 12 credits. Students receive transfer credit if they have completed language study that meets one of the following requirements:

- Completion of an AP or IB (HL) language exam:
- Language Exam – AP Score of 4 or 5 – 4 credits
- Literature Exam – AP Score of 4 or 5 – 4 credits
- IB (HL) Score of 4 or higher – 8 credits

Completion of foreign language study at a regionally accredited university or foreign equivalent with a grade of C or better. Courses taken must be non-remedial and a minimum of 3 semesters hour. Students receive 4 credits at Kettering University for each course taken up to a maximum of 12 credits.

#### **LIT-304 American Literature and Philosophy**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Selected topics founded and expressed in literature during the philosophic and the literary development of the Republic.

**LIT-307 Poetry: Substance and Structure**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

An analysis of poetry written in the context of the development of intellectual concepts. Emphasis is on the philosophical content, its moral and ethical dimensions, structure, and the intellectual climate which gave rise to significant aesthetic ideals. Biography and critical interpretation are included.

**LIT-309 The Literature of Multicultural America**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course examines U.S. multicultural literatures from several critical perspectives. A study of primary texts by American writers whose themes and techniques of narration reflect the development of U.S. literacy discourses of race, identity, myths of origin, gender, and cross-cultural communication. The broad array of texts includes novels, poetry, memoirs, and films from a multiplicity of cultural perspectives. Engagement in comparative work with an eye toward understanding the complexity and the demands of a multicultural society.

**LIT-310 African American Literature**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed.

This course examines the development of African American literature from its beginnings to today, and it focuses on both what makes it unique and what anchors it in an American national identity. We will read a variety of genres, including slave narratives, novels, and poetry, place them in their historical context, and address themes such as racial and cultural identity, forms of resistance, gender relations, and the role of music. Strict attendance policy. Writing is an important component of the course.

**LIT-311 Literatures of the African Diaspora**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As needed

This course examines literary texts written by people of African ancestry in the Atlantic world from the 18<sup>th</sup> to the 21<sup>st</sup> centuries. We particularly focus on issues related to racial and cultural identity, national identity, social class, and gender. Attention to historical context is an essential component of the course. Two major objectives are to sharpen students' reading and interpretive skills, and to improve their ability to write clearly, coherently, and persuasively. Lectures, discussions, and writing assignments all work to exercise critical thinking, a major goal of Liberal Studies.

**LIT-315 Literature of the Fantastic**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course examines the fantastic in literature and film. It includes such topics as the role of escapist literature in society, fantasy as satire and social criticism, and the use of both fantasy and horror literature and cinema to explore taboos about mortality, insanity, and sexuality.

**LIT-317 Masterpieces of Drama**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course examines several significant works of drama. Topics include the role of stage and cinematic drama in human society, drama as social criticism, and the nature of various kinds of dramatic works including tragedy, comedy, and satire.

**LIT-319 Indians, Aliens, and Others: Cross-cultural Encounters in Literature**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course focuses on literacy texts that stage cross-cultural encounters of various kinds to understand dilemmas and conflicts that arise on a daily basis in our multi-racial, postcolonial world. It studies how certain people and groups have been deemed "other" through processes of colonialism, globalization, migration, and diaspora. It also examines strategies people use to bridge cultural, linguistic, and other kinds of difference.

**LIT-351 Literature in a Foreign Language**

**400(4)**

Prerequisites: COMM-101, LANG-103 or equivalent, HUMN-201, SSCI-201

Corequisites: None  
 Minimum Class Standing: SO  
 Terms Offered: As Needed

This course provides an exposure to literature read and discussed in a foreign language. It further develops students' abilities in reading, speaking and writing a foreign language while providing familiarity with the literary heritage of a foreign culture.

### **LIT-372 Masterpieces of Literature**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None  
 Minimum Class Standing: SO  
 Terms Offered: As Needed

This course will concentrate on learning the characteristics of several literary genres as exemplified by master writers. The course may include genres such as: Epic Narrative poetry, Classical Satire, Classical Philosophy, Medieval Narrative Poetry, Realistic Novel, Modern Short Story & Novel.

### **LIT-374 Seminar on J.R.R. Tolkien**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None  
 Minimum Class Standing: None  
 Terms Offered: As Needed

Seminar on J.R.R. Tolkien: This seminar examines a range of J.R.R. Tolkien's works. These may include his epic, *The Lord of the Rings* in both the written and film versions (all viewings of the film will occur *outside of class*), his extended mythology in his unfinished *The Silmarillion*, his short stories and essays, and his shorter fantasy work *The Hobbit*. The course focuses on genre, style and themes of the works, with particular emphasis on the elements of myth and epic, and on the complex ways in which his work as a medieval scholar comes to bear on his writings and their interpretation.

### **LIT-379 The Plays of Shakespeare**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None  
 Minimum Class Standing: SO  
 Terms Offered: As Needed

This course will be a concentrated study of selected tragedies, comedies, and history plays by William Shakespeare. The emphasis will be on the universal human dimensions of the plays within the context of the Elizabethan age. Plays such as Hamlet, Twelfth Night, and Richard III will be used.

### **LS-489 Senior Seminar: Leadership, Ethics and Contemporary Issues**

**400(4)**

Prerequisites: COMM-101, COMM-301, ECON-201, HUMN-201, SSCI-201, a 300 level course in either Humanities or Social Science

Corequisites: None  
 Minimum Class Standing: SR  
 Terms Offered: All

This course examines the interrelated subjects of leadership, ethics and contemporary issues. Because it is a culmination of their general education, students in this course use the methods and perspectives learned in the preceding general education courses. After examining general theoretical approaches through a common text, the course will involve three "case studies" with suitable assigned readings. One case study will focus on a corporation in order to illustrate leadership, ethics and contemporary issues; a second will focus on a person in order to illustrate leadership, ethics, and contemporary issues; the third will focus on an important modern episode, event or condition that exemplifies issues of ethics and leadership.

### **Noted below are the Calculus I and II sequence requirements set by the Department of Mathematics:**

- Placement in MATH-100 → MATH-101X → MATH-102X
- Placement in MATH-101X → MATH-102X
- Placement in MATH-101 → MATH-102 (with minimum grade of C in MATH-101)  
                                   **OR** → MATH-102X (with *passing* grade of C- or lower in MATH-101)

### **MATH-100 College Mathematics**

**400(4)**

Prerequisites: Placement test. NOTE: Failure to take the math placement exam will result in placement in MATH-100.

Corequisites: None  
 Minimum Class Standing: None  
 Terms Offered: All

A study of functions and their algebra and graphs. Special functions of engineering and science are emphasized, including polynomial, trigonometric, and exponential functions and their inverses. Concepts and methods of algebra, trigonometry, and analytic geometry important to calculus are also emphasized. NOTE: Credits for MATH-100 do not apply to degree requirements (except the BBA). Also placement in MATH-100 may delay entry in courses for which calculus is a prerequisite.

### **MATH-101X Calculus I**

**420(4)**

Prerequisites: MATH-100, or a sufficient score on the placement exam, or permission of Department Head

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course is for students showing a lack of proficiency in algebra and trigonometry on the placement examination. The course contains the same material as MATH-101 but in addition, includes a review of algebraic expressions, trigonometric functions and their inverses, and analytic geometry. Computer software will be used to aid in understanding these topics.

### **MATH-101 Calculus I**

**400(4)**

Prerequisites: Sufficient score on the placement exam, or permission of Department Head

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

An introduction to the theory and techniques of differentiation of polynomial, trigonometric, exponential, logarithmic, hyperbolic, and inverse functions of one variable. Also included are limits, continuity, derivative applications and interpretations. Computer software will be used to aid in understanding these topics.

### **MATH-102 Calculus II**

**400(4)**

Prerequisites: MATH-101 with a minimum grade of C

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Riemann integration and the Fundamental Theorem of Calculus, including applications to area, volume, etc., and basic methods for conversion of integrals including change of variable, substitutions, partial fractions, integration by parts, improper integrals and numerical integration. Also introduced are sequences and series in one variable with emphasis on Taylor Series. Computer software will be used to aid in understanding these topics.

### **MATH-102X Calculus II**

**420(4)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course is for students who want to improve their skills in Trigonometry and Differential Calculus. It contains the same material as MATH-102 but is taught at a slower pace and with more examples and sample problems. In addition, it includes reviews of Trigonometry and Differential Calculus.

### **MATH-102H Calculus II - Honors**

**400(4)**

Prerequisites: MATH-101 and approval of Department Head

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Honors Calculus II is a deeper, more conceptual, rigorous, and limit based version of Calculus II (MATH-102). It is designed for students with strong mathematical skills. Riemann integration and the Fundamental Theorem of Calculus, including applications to area, volume, etc., and basic methods for conversion of integrals including change of variable, substitutions, partial fractions, integration by parts, improper integrals and numerical integration. Also introduced are sequences and series in one variable with emphasis on Taylor Series. Computer software will be used to aid in understanding these topics.

### **MATH-203 Multivariate Calculus**

**400(4)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A study of polar coordinates, parametric equations, and the calculus of functions of several variables with an introduction to vector calculus. Topics include surface sketching, partial derivatives, gradients, differentials, multiple integrals, cylindrical and spherical coordinates and applications. Computer software will be used to aid in understanding these concepts.

### **MATH-203H Multivariate Calculus – Honors**

**400(4)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H, and professor's recommendation

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

Honors Multivariate Calculus is an extended, deeper, more conceptual, rigorous, and limit-based version of Multivariate Calculus (MATH-203). The course is designed for students with strong mathematical skills. The topics include parametric equations, polar, Cartesian, cylindrical, and spherical coordinates, vector algebra, equations of lines, planes, and quadratic surfaces, calculus of functional of several variables, unconstrained and constrained optimization problems, multidimensional integrals, change of variables, and elements of vector calculus. Computer software will be used to aid in understanding these topics and for graphical visualization.

### **MATH-204 Differential Equations and Laplace Transforms**

**400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

An introduction to the principles and methods for solving first order, first degree differential equations, and higher order linear differential equations. Includes a study of the Laplace transform and its application to the solution of differential equations. Existence and uniqueness theorems for O.D.E.'s are also discussed.

**MATH-204H Differential Equations and Laplace Transform Honors**

**400(4)**

Prerequisites: MATH-203H or MATH-203, and professor's recommendation

Corequisites: None

Minimum Class Standing: FR

Terms Offered: All

Honors Differential Equations and Laplace Transform is an extended, deeper, more conceptual, rigorous version of MATH-204. The course is designed for students with strong mathematical skills. The additional topics include Cauchy-Euler Equation, the Dirac Delta Function, Linear Models: Boundary Value Problems, Systems of Linear Differential Equations, and optional advanced topics, e.g. Power Series Solution and Solutions About Singular Points.

**MATH-205 Applied Probability and Statistics**

**400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: The student may take MATH-203 as a co-requisite but must have permission from the instructor.

Minimum Class Standing: SO

Terms Offered: Winter, Spring

The study of the basic concepts and methods of probability and statistics. Topics covered include sample spaces, counting techniques, laws of probability, conditional probability, and dependence and independence. Broad variety of discrete and continuous distributions are studied, including moment generating functions. Functions of random variables are considered. The central limit theorem and sampling distributions are applied to point and interval parameter estimation. Broad aspects of testing statistical hypotheses for a simple population are included. Some applied statistical techniques are practiced with a statistical package.

**MATH-305 Numerical Methods and Matrices**

**400(4)**

Prerequisites: MATH-204 or MATH-204H

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: All

An introduction to numerical methods including the study of iterative solutions of equations, interpolation, curve fitting, numerical differentiation and integration, and the solution of ordinary differential equations. An introduction to matrices and determinants; application to the solution of linear systems.

**MATH-307 Matrix Algebra**

**400(4)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: MATH-102 or MATH-102X or MATH-102H

Minimum Class Standing: None

Terms Offered: All

A study of matrix concepts including such topics as basic algebraic operations, determinants, inversion, solution of systems of linear equations, vector spaces, basis and dimension, eigenvalues, and eigenvectors.

**MATH-308 Abstract Algebra**

**400(4)**

Prerequisites: MATH-307 or CS-211, and MATH-101 or MATH-101X

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

Students will learn topics in modern algebra and will practice proof techniques. Topics will include: congruence classes, modular arithmetic, groups, subgroups, normal subgroups, Lagrange's theorem, rings, subrings, ideals, quotient rings, isomorphisms and homomorphisms, polynomial arithmetic, fields, divisors, factorization, and proofs of the main theorems. The course is required for mathematics majors and is also useful in cryptography and quantum physics.

**MATH-310 Biostatistics I**

**302(4)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H

Corequisites: None

Minimum Class Standing: SO

Terms Offered: All

Students will learn methods of biostatistics and its applications in life sciences. Topics include: Descriptive Statistics; Elements of Probability theory; Bayes Rule; Discrete and Continuous Probability distributions; One-sample and two-sample estimation and hypothesis testing; Bayesian inference; Nonparametric Methods; Simple Regression Analysis.

Computer packages such as MINITAB will be used for all applications and the analysis of data sets.

**MATH-313 Boundary Value Problems**

**400(4)**

Prerequisites: MATH-204 or MATH-204H

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: Summer, Fall

An introduction to linear partial differential equations (PDE's) and basic techniques of applied mathematics used to solve initial, boundary value problems associated with these equations. Topics include: derivation of some of the fundamental PDE's and boundary conditions that arise in

science and engineering; Fourier Series; Sturm-Liouville Systems including eigenvalues, eigenfunctions and eigenfunction expansions; the separation of variables techniques; Fourier Transforms. Applications to problems of science and engineering will be given throughout the course.

**MATH-317 Advanced Matrix Theory**

**400(4)**

Prerequisites: MATH-307

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

A study of theory and applications of matrix algebra including determinants, rank, linear transformations, characteristic values, functions of matrices, orthogonality, similarity, and other advanced topics.

**MATH-321 Real Analysis I**

**400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

A more advanced study of functions in one real variable including limits, uniform continuity, differentiation, integration, and sequences and series of functions; topology of  $\mathbb{R}$ .

**MATH-327 Mathematical Statistics I**

**400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

A study of random variables and their distribution functions including expectations, transformations, moment generating functions, stochastic independence, and sampling distribution. Also, a study of order statistics and limiting distributions of sample mean.

**MATH-328 Methods of Applied Mathematics**

**400(4)**

Prerequisites: MATH-204 or MATH-204H

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

Topics from advanced calculus, dimensional analysis and scaling, perturbation and asymptotic methods, calculus of variations and integral equations. Applications of these tools to problems in engineering will be included.

**MATH-350 Financial Mathematics**

**302(4)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H, and BUSN-226 or MATH-327 or MATH-408

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

The course will provide an understanding of the fundamental concepts of financial mathematics. Definitions of key terms will be studied, including inflation, rates of interest, term structure of interest rates, yield rate, equation of value, accumulation function, discount function, annuity, perpetuity, stocks, bonds, mutual funds. Procedures like determining equivalent measures of interest, discounting, accumulating, amortization will be covered. Modern topics of financial analysis will be introduced, such as yield curves, spot rates, forward rates, duration, convexity, immunization, and short sales. Key terms of financial economics at an introductory level will be provided: derivatives, forwards, futures, short and long positions, call and put options, spreads, collars, hedging, arbitrage, and swaps.

**MATH-360 Life Contingencies I**

**400(4)**

Prerequisites: MATH-350

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

This course is an introduction to life insurance mathematics based on a stochastic approach. This course is to develop a student's knowledge of the theoretical basis of certain actuarial models and the application of those models to insurance and other financial risks. Definitions of key terms will be studied, including actuarial present value, survival model, life insurance, annuities, and benefit premiums.

**MATH-361 Life Contingencies II**

**400(4)**

Prerequisites: MATH-360

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

This is a continuation of Life Contingencies I. Development is based on a stochastic approach to life insurance models. Definitions of key terms will be studied, including benefit reserves, and multi-life and multiple-decrement models.

**MATH-408 Probability and Statistics**

**400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: All

This is a course in engineering statistics. Fundamentals of probability are introduced together with examples of discrete and continuous random variables. Descriptive and inferential statistics for one and two populations is covered. Simple linear regression, one-way and two-way and ANOVA DOE including fractional designs are discussed. Elements of reliability and SPC are covered. The use of statistical software is a necessary part of this course. A brief introduction to MINITAB (a statistical package) is given.

**MATH-410 Biostatistics II****302(4)**

Prerequisites: MATH-310

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: All

Design of experiments and data analysis useful in Biostatistics including analysis of variance and covariance, nested designs, multiple regression, logistic regression and log-linear models. Life sciences applications and case-studies. Computer packages such as MINITAB will be used for all applications and the analysis of data sets.

**MATH-412 Complex Variables****400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

An introduction to the theory of complex variables. Includes basic algebra of complex numbers, analytic functions and the Cauchy-Riemann equations, elementary transformations, complex integration, the Cauchy integral formulas, Taylor and Laurent series, and the theory of residues.

**MATH-416 Vector Analysis****400(4)**

Prerequisites: MATH-203 or MATH-203H

Corequisites: None

Minimum Class Standing: SO2

Terms Offered: Winter, Spring

An introduction to vector algebra and calculus including vector products, vector functions, and their differentiation and integration, gradients, line and surface integrals, conservative fields and potentials functions, Green's theorem, parametric equations, curvature, and curvilinear coordinates.

**MATH-418 Intermediate Differential Equations****400(4)**

Prerequisites: MATH-204 or MATH-204H, MATH-305

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

A study of systems of linear and nonlinear ordinary differential equations (ODE's). Systems of linear ODE's, matrix methods, variation of parameters, and perturbation methods and boundary layers, phase portraits and stability of nonlinear ODE's. Numerical methods for solving systems of ODE's will be presented and used to solve physical problems of applied mathematics and engineering.

**MATH-420 Mathematical Modeling****400(4)**

Prerequisites: MATH-204 or MATH-204H, MATH-205, MATH-305

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

A study of the process of translating real-world problems into mathematical models. Various methods of formulation and solution of models will be illustrated by practical examples.

**MATH-421 Real Analysis II****400(4)**

Prerequisites: MATH-317, MATH-321

Corequisites: None

Minimum Class Standing: JR2

Terms Offered: Winter, Spring

An introduction to the study of real functions including metric spaces, normed linear spaces, Hilbert Spaces, and linear operators.

**MATH-423 Partial Differential Equations****400(4)**

Prerequisites: MATH-305, MATH-313

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter, Spring

This course is a continuation of MATH-313. Topics include Bessel's equation and Legendre's equation, boundary value problems in curvilinear coordinate systems, Green's functions for ordinary and partial differential equations. Applications to problems of science and engineering will be given throughout the course.

**MATH-427 Mathematical Statistics II****400(4)**

Prerequisites: MATH-327

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

A further study of statistics including point and interval estimation, sufficient statistics, Bayes estimates, UMP tests, likelihood ratio tests, goodness of fit tests, an introduction to non-parametric methods. Regression analysis and ANOVA models are included.

**MATH-428 Sampling Theory**

**400(4)**

Prerequisites: MATH-327

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Winter, Spring

A study of sampling theory including probability sampling, simple random sampling, sample size estimates, stratified sampling, and cluster sampling.

**MATH-438 Data Analysis for Engineers and Scientists**

**400(4)**

Prerequisites: IME-332 or MATH-205 or MATH-408

Corequisites: None

Minimum Class Standing: SR

Terms Offered: As Needed

This course will cover topics in sampling techniques, data analysis and regression, design of experiments, and statistical quality and process control. In this course, the student will be given hands-on experience by combining lectures with laboratory classes involving the use of computers and appropriate statistical packages. The student taking this course is assumed to have taken an introductory course in probability and statistics.

**MATH-448 Time Series**

**400(4)**

Prerequisites: MATH-327

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This course is designed to provide a working knowledge of time series and forecasting methods as applied in economics, engineering, and the natural and social sciences.

**MECH-100 Engineering Graphical Communication**

**204(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This computer aided design and drafting course is an introduction to engineering graphics and visualization with topics to include sketching, line drawing, wire-frame section development and elements of solid modeling. Also, this course will include the development and interpretation of drawings and specifications for product realization. CAD, office, and web-based software will be used in student presentations and analysis.

**MECH-210 Statics**

**400(4)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: MATH-102 or MATH-102X or MATH-102H, and PHYS-114 and PHYS-115

Minimum Class Standing: None

Terms Offered: All

This course deals with a discussion and application of the following fundamental concepts: (1) static force analysis of particles, rigid bodies, plane trusses, frames, and machines; (2) first and second moments of area; (3) friction; (4) internal forces; and (5) stress deflection analysis of axially loaded members. Topics covered will be (1) the static force and moment equilibrium of two and three dimensional systems; (2) resultant forces and moments due to the application of concentrated and/or distributed loads; (3) couples; (4) the center of mass and the area moment of inertia of a rigid body; (5) shear force and bending moment diagrams of a rigid body; and (6) the stress and deflection analyses of axially loaded members. Free body diagrams will be formulated in a computer-aided environment in order to enhance the students' critical thinking and problem solving capabilities. Several open-ended homework and mini projects will be assigned in order to incorporate a design experience in the course.

**MECH-212 Mechanics of Materials**

**400(4)**

Prerequisites: MECH-210

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

The fundamental topics of this course include: normal and shear stress and strain, Hooke's law, Poisson's ratio, generalized Hooke's law, axial translation, torsion of circular bars, angle of twist, bending of beams, flexure formula, flexural shear stress, beam deflections, combined stresses, transformation of stresses, Mohr's circle, statically indeterminate problems, columns. The use of basic computational tools will be introduced at the end of several lecture modules including: axial loading, torsional loading, and flexural loading. Homework and design projects will be assigned.

**MECH-231L Signals for Mechanical Systems Lab**

**002(1)**

Prerequisites: None

Corequisites: EE-212

Minimum Class Standing: None

Terms Offered: All

This lab complements the electrical engineering course, EE-212, and provides the necessary knowledge and skills of electrical engineering to non-electrical engineering majors. It teaches students how to use sensors and instruments to make meaningful measurements in mechanical and electrical engineering systems. This lab course introduces students to: (1) the laws and methods of circuit analysis (2) sensors used in



measurements of displacement, temperature, strain and fuel cell systems and (3) the amplifiers and other instrumentation used to process the signals from these sensors.

**MECH-300 Computer Aided Engineering**

**400(4)**

Prerequisites: MECH-100, MECH-212

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This is a threaded continuation of MECH-100, Engineering Graphical Communication using computer graphics and computer aided design techniques. These advanced techniques use graphics primitives, construction functions, transformations, image control, dimensioning and layers. Both two-dimensional drawings and three-dimensional wireframe, surface modeling, and simulation modeling such as FEA and kinematic motion are covered.

**MECH-310 Dynamics**

**400(4)**

Prerequisites: MATH 102 or MATH-102X or MATH-102H, and MECH-210, PHYS-114, PHYS-115

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course deals with a discussion and application of the following fundamental concepts: (1) application and basics of Newtonian mechanics and physical laws; (2) a study of the kinematics and kinetics of a particle including relative and absolute motion, friction concepts; (3) additional analysis of particle dynamics using work-energy and impulse-momentum methods, analysis of impact events; (4) analysis of a system of particle using work-energy, impulse, linear and angular momentum; (5) kinematics and kinetics of a rigid bodies analyzed in various reference systems; (6) additional analysis of rigid body dynamics using work-energy and impulse-momentum; (7) inertia quantities. Computational techniques will be incorporated into several design projects throughout the semester to illustrate alternative solution methods.

**MECH-311 Introduction to Mechanical System Design**

**204(4)**

Prerequisites: MECH-100, MECH-210

Corequisites: EE-212, MECH-231L

Minimum Class Standing: None

Terms Offered: All

The objective of the course is to teach fundamentals of machine elements and mechatronics design, with an emphasis on product design and fabrication. Design, analysis and fabrication of prototype mechatronic systems and devices are completed. Mechanical designs concepts including transmission methods, force and torque analysis, mechanisms and simulation is covered. Formal design processes such as brainstorming and concept-tree development are utilized. Intellectual property law pertinent to design and invention is covered. The synergistic combination of sensors, actuators and controls technologies to create functionally "smart" and adaptive devices is implemented. Sensors and actuator technologies are covered. The course culminates with an open-ended project to design and fabricate a mechatronic system using basic machining equipment and a programmable controller.

**MECH-312 Mechanical Component Design I**

**400(4)**

Prerequisites: MECH-212

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course involves application of theory and techniques learned in the mechanics courses to the concepts of mechanical component design. Through lectures and class example and homework problems the student will be introduced to design methodology. This methodology requires learning to develop and set-up a mechanical component design problem, through properly understanding and solving the problem based upon the given data, design constraints, making and verifying assumptions. Selection of the proper analytical tools as required, producibility and maintainability of the design, materials selection, safety, and cost considerations. Take-home project problems will enhance and demonstrate the type of study and research required for design. Topics to be studied include strength and fatigue considerations, shaft design, threaded fasteners, lubrication and bearings, springs, and fundamentals of gear analysis, including forces, stresses and terminology.

**MECH-320 Thermodynamics**

**400(4)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

A study of the first and second laws of thermodynamics and their application to energy transformations during various processes. Property relations are studied for pure substances, ideal gases, mixture of ideal gases, and atmospheric air. Steam power cycles, refrigeration cycles, spark-ignition and compression-ignition engines, and turbine cycles are evaluated to determine performance parameters and energy efficiencies.

**MECH-322 Fluid Mechanics**

**400(4)**

Prerequisites: MECH-320

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This is a first course in Fluid Mechanics that involves the study of fluid flow in ducts and over objects. The course introduces the fundamental aspects of fluid motion, fluid properties, flow regimes, pressure variations, fluid kinematics, and methods of flow description and analysis. Presents the conservation laws in their differential and integral forms, and their use in analyzing and solving fluid flow problems. In addition, the concept of using similitude and dimensional analysis for organizing test data and for planning experiments is introduced. The effects of fluid friction on pressure and velocity distributions are also discussed. The effects of compressibility (various density) on fluid flows are also included.

**MECH-330 Dynamic Systems with Vibrations****302(4)**

Prerequisites: MATH-204 or MATH-204H, MECH-310

Corequisites: MATH-305 or MATH-307 and EE-210 or EE-212

Minimum Class Standing: None

Terms Offered: All

This is a first course in System Dynamics. The object of this course is to provide an understanding into basic principles and methods underlying the steady state and dynamic characterization of physical systems and components. The focus is on multi-discipline approach. Construction of mathematical models of systems using Bond-graph and computer simulation (both in time and frequency domains) using software tool(s) is emphasized. Application of modeling techniques to understanding the behavior of free vibration (damped and undamped), forced vibration for harmonic excitation, and systems involving multi-degree freedom-including applications such as vibration absorber-will be discussed.

**MECH-350 Introduction to Bioengineering Applications****400(4)**

Prerequisites: BIOL-241, and/or CHEM-145, MECH-212

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course deals with a discussion and application of the following fundamental concepts. (1) basic anatomy and physiology of the overall human body; (2) basic anatomy and physiology of specific structures including brain, ear, eyes, heart, kidney, gastro-intestinal system, articular joints, and bones; (3) an appreciation of the engineering basis for current and developmental products designed to diagnose and replace these biological structures; (4) exposure to biochemistry, biomaterials, and biomechanics at a fundamental level; and (5) an understanding of current laws which govern bioengineering device manufacturing. A semester project will require the student to rigorously research an existing product or emerging technology of relevance to bioengineering and the human body.

**MECH-412 Mechanical Component Design II****400(4)**

Prerequisites: IME-301, MECH-312

Corequisites: None

Minimum Class Standing: None

Terms Offered: Directed Study

This course is an extension of MECH-312, Mechanical Component Design I. Topics to be studies will include wear and contact stress analysis, helical and bevel gear systems, impact analysis, temperature effects in design, introduction to fracture mechanics, code based design, welded connections, and topics selected by the students. Course work will consist of lectures plus, the students will perform research on these topics and provide written and oral reports, including examples.

**MECH-420 Heat Transfer****400(4)**

Prerequisites: MECH-320

Corequisites: MECH-322

Minimum Class Standing: None

Terms Offered: All

This course addresses the principles of heat transfer by conduction, convection, radiation and energy conservation, fins, steady-state and transient problems, and analysis and selection of heat exchangers.

**MECH-422 Energy Systems Laboratory****204(4)**

Prerequisites: MECH-320, MECH-322

Corequisites: MECH-420

Minimum Class Standing: None

Terms Offered: All

A laboratory course dealing with the detailed application of the first and second laws of thermodynamics; continuity, momentum, and energy equations; and principles of conduction, and convection to a variety of energy systems. Topics such as internal and external flows, refrigeration, psychrometrics, aerodynamic lift and drag, pump and fan performance, compressible flow and shock waves, free and forced convection, and heat exchangers are covered. Computational fluid dynamics (CFD), automatic data acquisition, flow visualization, and a design experience are incorporated into various laboratory experiments.

**MECH-430 Dynamic Systems with Controls****302(4)**

Prerequisites: MATH-305, MECH-330

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This is a second course, follow up course, in System Dynamics. The objective of this course is to provide an understanding into basic principles and methods underlying the steady state and dynamic characterization of feedback control systems. The focus is on multi-discipline approach as in the previous course. Construction of mathematical models of systems using Bond-graphs, block diagrams and development of transfer functions and state space models is emphasized. System performance is studied mainly using computer simulation (both in time and frequency domains) software tool(s). Design of control systems is attempted using the same computer simulation tools. Introduction to some advanced topics in control systems is also provided.

**MECH-490 Fluid Power Systems****402(4)**

Prerequisites: MECH-300

Corequisites: MECH-312

Minimum Class Standing: None

Terms Offered: As Needed

This course begins with basic hydraulics circuits followed by the sizing and control of hydraulic cylinders and motors. Prime movers are introduced and matched to system requirements. Valves are described while circuit tracing and component recognition are emphasized. The course also addresses air consumption, pneumatic component sizing and ladder logic. There will be limited consideration of hydraulic servo and two design projects.

**MECH-510 Analysis and Design of Machines and Mechanical Assemblies**

**400(4)**

Prerequisites: MECH-300, MECH-310, MECH-312

Corequisites: MECH-330

Minimum Class Standing: None

Terms Offered: Directed Study

The main aim of this course is to integrate the concepts of kinematic and dynamic analysis to the design of machines and mechanical assemblies used in automotive, medical equipment and other applications. These include (but not limited to) the analysis and design of reciprocating engine sub-systems such as, piston cylinder mechanism, steering linkages, window and door-lock mechanisms, over-head valve linkage system, flywheel, gears and gearboxes, universal coupling and automotive differential. Synthesis of mechanism systems used in medical equipment area will also be covered. Kinematic and dynamic characteristics such as displacement, velocity, acceleration and forces are analyzed by graphical and analytical methods. CAE tools will be used to perform kinematic, dynamic and stress analyses and fatigue design of these systems using CAE tools. Temperature effects will also be included wherever appropriate in the design. Several practical design projects will be assigned during the term of this course.

**MECH-512 Mechanical Systems Design Project**

**400(4)**

Prerequisites: IME-301 or PHYS-342, MECH-300, MECH-312

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

The fundamental topics of this course include: The engineering design process, ethics, teamwork, brainstorming, conceptual designs, proposal writing, project planning, project management, product attributes, design criteria, engineering targets, physical simulation, virtual simulation, analysis techniques, design synthesis, alternative designs, bill of materials, bill of process, manufacturability, product variations, product quality, design reports and presentations. Note: Satisfies ME Senior Design Project requirement.

**MECH-514 Experimental Mechanics**

**204(4)**

Prerequisites: IME-301 or PHYS-342, MECH-300, MECH-312, MECH-330

Corequisites: None

Minimum Class Standing: SR2

Terms Offered: Winter, Spring

The primary purpose of this course is to provide fundamental knowledge in the theory and practical experience in the application of mechanical engineering measurements. Viewed as a system, consideration is given to the performance, limitations, and cost of the detection - transducing stage, the signal conditioning stage and the final termination or readout - recording stage. Sensors such as resistive, capacitive or inductive are considered for the transducing stage. Signal conditioning stage emphasizes the use of a Wheatstone Bridge circuit, operational amplifiers and digital processing. The final readout or termination stage considers visual readouts such as analog or digital meters, charts or scopes in addition to memory devices such as computer hard drives and microprocessors. Nearly 2/3 of the time is spent on an approved team project that produces experimental measurements, which adds knowledge or understanding to some theoretical concepts or rhetorical inquiry. Course is structured so as to qualify as a capstone for cognate mechanical engineering students. Others may use it as a technical elective.

**MECH-515 Failure and Material Considerations in Design**

**400(4)**

Prerequisites: None

Corequisites: MECH-412

Minimum Class Standing: None

Terms Offered: Winter, Spring

Designing components that are safe and reliable requires efficient use of materials and assurance that failure will not occur. Even still, components do fail. In this course, students will be introduced to the techniques of designing for life and material considerations involved in that process. In addition, students will also study how to analyze those components which do fail, and evaluate safe-life and remaining life in a design through the study of real-life component design and current failures.

**MECH-516 Introduction to Finite Element Analysis with Structural Application**

**400(4)**

Prerequisites: MECH-212, MECH-310, MECH-330

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

The theory of the Finite Element Method will be introduced. Applications of static and dynamic finite element analysis of real world mechanical systems will be performed. Commercial F.E.A. codes such as SDRC/I-DEAS and MSC/NASTRAN will be utilized.

**MECH-521 Energy and Environmental Systems Design**

**400(4)**

Prerequisites: IME-301 or PHYS-342, MECH-300, MECH-312, MECH-420

Corequisites: MECH-422

Minimum Class Standing: SR2

Terms Offered: Summer, Fall

The objective of this course is to provide a comprehensive capstone design experience in the engineering and design of energy systems. Students will work in design teams to complete the design of an energy efficient and environmentally friendly system for use in a residential or commercial building, a power plant, or any other system that requires energy. The course covers one or more of the following energy sources or energy conversion devices: fossil, solar, wind, tidal, hydro, wave, biomass, geothermal, alternative fuels, or fuel cells.

**MECH-523 Applied Computational Fluid Dynamics****400(4)**

Prerequisites: MECH-320, MECH-322 and MATH-313 or MATH-418, or MATH-423, or Permission of Instructor

Corequisites: None

Minimum Class Standing: None

Terms Offered: Fall

This course includes solution methods to the Navier-Stokes equations in a discrete domain. Grid generation, coordinate transformation, discretization, explicit, implicit, semi-implicit, a variety of algorithms, post-processing, and interpretations of results are discussed. Solution techniques for compressible and incompressible flows, their applicability, robustness, and limitations are covered. External and internal flows with and without chemical reactions are also discussed. The learning process involves hands-on experience on grid generation, setting up a CFD code, post-processing, and a thorough discussion on the results. The students will work on a final project that is a practical problem of significant magnitude and importance to industry. This work must be publishable in the student's journal or presentable in a conference.

**MECH-525 Introduction to Multiphysics Modeling and Simulation in Fluid Mechanics and Heat Transfer****400(4)**

Prerequisites: MECH-322, MECH-420

Corequisites: None

Minimum Class Standing: None

Terms Offered: Fall, Winter

This course solves a variety of engineering problems with the aid of computational software mainly in the field of fluid mechanics and heat transfer. Pipe flow, incompressible flow, laminar and turbulent flow, drag, and lift are subjects covered during the first part of the course. In the second part, topics in heat transfer are used such as conduction in solids, fin design, convection, heat exchangers, and radiation. In a third part, selected topics in electrical conductive media and reaction engineering are also covered. This course compliments MECH-322 and MECH-420 and could be considered an extension of the two courses where problems are solved in 2D and 3D using computational software. Different types of meshes will be discussed, post-processing of data will be analyzed through graphical techniques, and graphical results will be compared to well-known analytical solutions. Students will also complete a final project where both fluid mechanics and heat transfer physics will be used to solve practical engineering problems.

**MECH-526 Fuel Cell Science & Engineering****400(4)**

Prerequisites: CHEM-237/238 or CHEM-361 or PHYS-452, MECH-325 or MECH-420

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

The objectives of this course are to introduce the students to and provide an extensive experience in the engineering and design of fuel cell devices. The course lecture will cover the five main types of fuel cells and their operational parameters and applications, efficiency and open circuit voltages. Other topics include: fuel cell systems, compressors, turbines, fans, blowers, pumps, DC voltage regulation and voltage conversion, fuels for fuel cells and methods of processing. Codes and standards of operating a fuel cell powered device will be presented as well as laws regulating the transportation of hazardous materials contained within these devices. Students will also study the design requirements for the introduction of fuel cells into various devices such as: golf-cart, bicycles, laptops, toys, road signs, etc. The lecture is supported with laboratory experiences.

**MECH-527 Energy and the Environment****310(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course covers energy conversion and conservation, fossil fuels, renewable and bio-fuels, solar, geothermal and nuclear energy, alternative energy (wind, water, biomass), hydrogen as an energy carrier, historical context of the technology, the role of energy in society (economic, ethical, and environmental considerations), energy forecasts and the trend toward a hydrogen economy. Public policy, global warming and CO<sub>2</sub> footprints and offsetting are also discussed. Several laboratory experiments including solar heating, ethanol production and wind energy will be included in this course.

**MECH-528 Bio and Renewable Energy Laboratory****212(4)**

Prerequisites: MECH-320, MECH-322

Corequisites: None

Minimum Class Standing: None

Terms Offered: Spring, Summer

This course provides an opportunity for the students to perform hands-on laboratory experiments in the area of sustainable energy. The fundamental principles required will be provided prior to laboratory experimentation. Topics covered include but are not limited to PEM and solid oxide fuel cells, energy storage in batteries and ultra-capacitors, heat of combustion and calorimetry, solar-thermal energy and photovoltaics, wind energy, ethanol production from corn and sugar and bio-diesel extraction from algae. A field-trip is also included as a part of this course.

**MECH-529 Design and Modeling of Fuel Cell Systems****400(4)**

Prerequisites: MECH-322, MECH-420

Corequisites: MECH-422, MECH-526

Minimum Class Standing: None

Terms Offered: Directed Study

A fuel cell is an electrochemical device that directly converts energy from fuels into electrical power. It has the potential for highly efficient and environmentally-friendly power. Recently, emphasis has been placed into the development of fuel cell systems for power sources including portable, APU, and stationary applications. The fundamental principles applied to fuel cells including the relevant electrochemistry,

thermodynamics, and transport processes will be reviewed in this course. The primary focus will be on fundamental principles and processes in proton exchange membrane fuel cells and solid oxide fuel cells including modeling of both types of cells. An introduction to fuel cell stack design and system integration will be presented, in which the analysis and optimization of various components will be discussed. A survey of the cutting-edge issues including the future direction of fuel cell technology will also be conducted. Class projects will focus on the design of a fuel cell system for an application chosen by the students where teamwork will be emphasized. This course is designed to provide the student with the know-how to design a fuel cell system for a specific application of power generation.

**MECH-540 Introduction to Internal Combustion Engines and Automotive Power Systems 400(4)**

Prerequisites: MECH-320

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

The fundamentals of internal combustion engines (ICE) is an introduction to engine design with topics that include: air capacity, engine vibration, kinematics and dynamics of the crank mechanism, air cycles, combustion, petroleum and alternative fuels, engine electronics and fuel cells. Automotive emissions, government standards, test procedures, instrumentation, and laboratory reports are emphasized.

**MECH-541 Advanced Automotive Power Systems 400(4)**

Prerequisites: MECH-540

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course serves to expand student's knowledge of automotive power systems. Topics covered include, detailed thermodynamic cycle analysis of various power cycles, emerging alternative fuels and power systems for automotive use (current topics include high-blend alcohol/gasoline fuels, gasoline direct injections (GDI) engines, hybrid electronic Powertrains, and fuel-cells). Students are also expected to work on design projects which are determined by the instructor. Students are expected to work on projects leading to the development of presentations and/or technical papers for professional society meetings (i.e. SAE, Global Powertrain Congress, etc.).

**MECH-542 Chassis System Design 400(4)**

Prerequisites: MECH-330

Corequisites: None

Minimum Class Standing: None

Terms Offered: Spring, Summer

The objective of this course is to provide a comprehensive experience in the area of automotive chassis engineering. Students will work in teams to complete a chassis design project applicable to passenger cars or light trucks. The course covers tires and wheels, brakes, suspensions and steering. A vehicle system approach is used in learning and applications and the logic of vehicle dynamics and the science of improvement are integrated into the course content. Professional computer aided engineering tools are introduced and applied in the areas of suspension design and overall vehicle dynamic performance.

**MECH-544 Introduction to Automotive Powertrains 400(4)**

Prerequisites: MECH-212

Corequisites: MECH-312

Minimum Class Standing: None

Terms Offered: Winter, Spring

An introduction to the performance of motor vehicle and the design of automotive power transmission systems. Topics covered include, loads on the vehicle, evaluation of various engine and vehicle drive ratios on acceleration performance and fuel economy, manual transmission design, and automatic transmission design.

**MECH-545 Hybrid Electric Vehicle Propulsion 400(4)**

Prerequisites: None

Corequisites: EE-432 or MECH-430 or Permission of Instructor

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course is an introduction to the principles of hybrid electrical vehicle propulsion systems for Mechanical and Electrical Engineering students. A major emphasis of the course will be to broaden the mechanical engineering student's knowledge of electrical engineering so that he/she can understand the fundamentals of electrical motors, electrical motor controls, and electrical energy storage systems. The course is also intended to strengthen the knowledge of electrical engineering students relative to automotive powertrain design. With this background, the integration of these hybrid electric components into the hybrid electric vehicle powertrain system will be studied, including electric energy storage (batteries, flywheels, ultra-capacitors) and electrical energy production-fuel cells. Relevant codes and standards will be emphasized.

**MECH-546 Vehicle Systems Dynamics 400(4)**

Prerequisites: MECH-330

Corequisites: None

Minimum Class Standing: None

Term Offered: Summer, Fall

This course begins with an introduction of Ride and Handling concepts followed by the study of mechanics' of pneumatic tires. Mathematical models for ride and handling are derived and presented. Vehicle ride and handling design criteria are demonstrated. Chassis design factors (CDF) and their effect on ride and handling are emphasized. Static, Dynamic and proving ground testing will be presented and demonstrated. Computer simulation design using software (e.g. Matlab, Mathcad, ADAMS Working model, SSnap, Car-Sim and others) will be used as an integral part of the course and for the two projects assigned during the semester. Overview on state-of-the-art technology and latest developments in the field of vehicle systems dynamics (e.g.SAE, ASME publications) will be part of this course.

**MECH-548 Vehicle Design Project**

**400(4)**

Prerequisites: IME-301 or PHYS-342, MECH-320

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This course deals with a comprehensive vehicle design experience progressing from problem definition through ride, handling, chassis design, performance analysis to sketches, alternate design, general design, layout drawings, parts list of the chassis, body, suspension powertrain and culminating with small-scale model of the vehicle and its subsystems. Note: Satisfies ME Senior Design Project requirement.

**MECH-550 Automotive Bioengineering: Occupant Protection and Safety**

**400(4)**

Prerequisites: MECH-310

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

This course deals with a discussion and application of the following fundamental concepts: (1) an overview of Federal Motor Vehicle Safety Standards; (2) basic anatomy and physiology of the overall human body; (3) introduction to injury biomechanics including rate, load, and acceleration dependent injury mechanisms; (4) overview of injury prevention strategies including a variety of air bags, multipoint restraint systems, and occupant sensing methodologies; (5) the basic structure and function of anthropomorphic test devices; (6) introduction to experimental crash simulation; (7) virtual occupant simulation using MADYMO or similar computational tools.

**MECH-551 Vehicular Crash Dynamics and Accident Reconstruction**

**400(4)**

Prerequisites: MECH-310

Corequisites: None

Minimum Class Standing: None

Terms Offered: Summer, Fall

This course deals with a discussion and application of the following fundamental concepts: (1) 2D and 3D dynamics of vehicular crash, (2) application of linear and angular momentum principles to vehicular impact, (3) application of energy principle to vehicular impact, (4) estimation of crash energy from vehicular crush profile, (5) vehicular crash pulse analysis, (6) occupant kinematics, (7) dynamics of rollover and pole collision, (8) crash data recorder (CDR) analysis, (9) and special topics in accident investigation forensics.

**MECH-554 Bioengineering Applications Project**

**400(4)**

Prerequisites: IME-301 or PHYS-342, MECH-300, MECH-310, MECH-312, MECH-350

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

This course deals with a comprehensive design experience focusing on a project with direct application to the bioengineering field. The course emphasizes the steps of a typical design process (problem identification, research, and concept generation) culminating in a documentation of the preferred embodiment of the design concept. The conceptual design will then be further developed through the application of sound engineering analysis and tools. Note: Satisfies ME Senior Design Project requirement.

**MECH-562 Compressible Flow/Gas Dynamics**

**301(4)**

Prerequisites: MECH-320, MECH-322 or Permission of Instructor

Corequisites: None

Minimum Class Standing: None

Terms Offered: Spring

The course includes the derivation and physical interpretation of the Navier-Stokes equations for compressible flows. Analysis of one-dimensional flows with discussions on normal, oblique, and bow shocks. Sound waves and unsteady wave motion are also covered. The method of characteristic (MOC) is taught and standard JANNAF CFD codes is utilized to understand the compressible flows and shock formation and behavior. The study is then further carried out to nozzle flows and jet/shock layer interaction. The students are required to not only understand the conventional methods used to obtain solution for compressible flow problems, but also to be able to utilize CFD and experimental methods to obtain solution for complex problems.

**MECH-564 Aerodynamics and Wing Theory**

**400(4)**

Prerequisites: MECH-320, MECH-322, MATH-305 or MECH-522, or permission of instructor

Corequisites: None

Minimum Class Standing: None

Terms Offered: Spring

The course includes discussions on fundamentals of inviscid and viscous incompressible flows. Important topics in fluid mechanics such as potential flow, vortices, point sources, and coupling of inviscid and boundary layer flows are covered. Two and three dimensional wings (or airfoils) and some exact solutions to such flow problems are discussed. Semi-analytical methods for disturbance distribution on wings are introduced by perturbation method. The computational Panel method for two and three dimensional aerodynamics problems is discussed. Commercial computer programs are used to solve realistic problems in a three dimensional space.

**MECH-570 Computer Simulation of Metal Forming Processes**

**400(4)**

Prerequisites: IME-301, MECH-212, MECH-310

Corequisites: MECH-300

Minimum Class Standing: None

Terms Offered: Directed Study

The main aim of this course is to introduce some of the latest techniques for modeling bulk and surface deformation processes through computer simulation. This requires an integration of the knowledge attained in other related courses such as engineering materials, solid mechanics, dynamics, and computer-aided engineering. The computer simulations include sheet metal forming operations, rolling, swaging and the other bulk deformation processes. Modern high-speed computer aided design methodology is introduced to study the behavior of the material during metal forming process, including the study of the strain pattern. Commercially available one-step and incremental software codes such as Quickstamp®, and LS-DYNA® will be used for the course. These solution procedures along with limitations of the software will be discussed with emphasis on techniques in an applied manner.

**MECH-572 CAD/CAM and Rapid Prototyping Project**

**400(4)**

Prerequisites: MECH-100, MECH-300

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

Capstone design project course in which students acquire an integrating experience leading them from CAD of a part (designed using sculptured surface and solid modeling techniques), through rapid prototyping of that part (using stereolithography) and into mold or die design and manufacture (using CAD/CAM system such as Unigraphics NX). This course can be used as an ME Elective or Free Elective if another ME capstone course is completed.

**MECH-580 Properties of Polymers**

**400(4)**

Prerequisites: IME-301, MECH-212, MECH-300

Corequisites: None

Minimum Class Standing: None

Terms Offered: Directed Study

This course begins with thermo-mechanical properties of commodity thermoplastics and includes a review of structure/nomenclature. The course then addresses: polymer shape and size, amorphous and crystalline states,  $T_g$ ,  $T_m$ , rubber elasticity and viscoelasticity (creep). There will be materials' selection and design projects.

**MECH-582 Mechanics and Design Simulation of Fiber-Reinforced Composite Materials**

**400(4)**

Prerequisites: MECH-212, MECH-300

Corequisites: None

Minimum Class Standing: None

Terms Offered: Directed Study

This course focuses on the properties, mechanics, and design simulation aspects of fiber-reinforced composite materials. Topics include: constituents and interfacial bonding, microstructure and micromechanics, theory of anisotropy, classical laminate theory, material characterization, failure and damage, manufacturing techniques, composite structure design, and introduction of nanocomposite.

**MECH-584 Plastics Product Design**

**204(4)**

Prerequisites: IME-301 or PHYS-342, MECH-300, MECH-310, MECH-312

Corequisites: None

Minimum Class Standing: SR3

Terms Offered: Summer, Fall

Capstone design class for Plastics Product Design Specialty students. A comprehensive product plastic design experience beginning with problem definition, which leads to material selection and progresses into physical design. Students will perform structural FEA and mold filling simulations on solid models. Computing piece price and tooling costs will complete the design process.

**MECH-595 Automotive Seminar I**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

Kettering has a partnership with the Society of Automotive Engineers (SAE) to offer both a certificate in Automotive Systems, as well as, a graduate degree in either Automotive Systems or the Mechanical Cognate. This seminar course would be comprised of a total of 4 Continuing Education Units (CEU) from SAE seminars, which have been reviewed and approved by a faculty review committee, consistent with Graduate academic policy. The transfer of credit must be supported by documentation from SAE for each individual applicant seeking such transfer.

**MECH-596 Automotive Seminar II**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

Kettering has a partnership with the Society of Automotive Engineers (SAE) to offer both a certificate in Automotive Systems, as well as, a graduate degree in either Automotive Systems or the Mechanical Cognate. This seminar course would be comprised of a total of 4 Continuing Education Units (CEU) from SAE seminars, which have been reviewed and approved by a faculty review committee, consistent with Graduate academic policy. The transfer of credit must be supported by documentation from SAE for each individual applicant seeking such transfer.

**MEDI-221 Elements of Medical Scribing**

**200(2)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course serves as an introduction to medical scribing. It will cover topics including: the rationale for the medical scribe, the role of EMR with regard to reimbursements and the delivery of quality care. Basic aspects of the History and Physical exam for common healthcare problems will be presented as well as issues related to patient safety and confidentiality.

**MGMT-395 Labor Relations**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: As Needed

This course examines the development and growth of the labor movement in the United States and beyond. The evolution of the legal framework for collective bargaining in the private sector is reviewed including current laws and administrative procedures. Topics include the growth of labor organizations, conflict resolution through grievance/arbitration and other relevant labor topics.

**MGMT-456 Strategic Management**

**400(4)**

Prerequisites: FINC-311, MGMT-350, MRKT-370

Corequisites: None

Minimum Class Standing: SR

Terms Offered: Summer, Fall

The capstone business class focuses on the formulation and implementation, and evaluation of organizational policy and strategy from the perspective of the general manager. Consideration is additionally given to information technology, global operations, ethics, and the functional level strategies of the organization. An integrative approach uses the case method to explore executive decision making in the global marketplace.

**MGMT-461 Operations Management**

**400(4)**

Prerequisites: MGMT-350

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

The objective of this course is to provide students with a basic understanding of issues in both manufacturing and services as well as to the management of productive resources. The course will expose students to the technical and behavioral sides of operations management, the activities of an operations manager, and the skills set needed to achieve productivity and quality while producing goods and services on time. Topics to be covered are: production objectives, design and improvement of production processes, capacity management, production planning and control, quality control, service operations, JIT, and materials management.

**MGMT-469 Fundamentals of Supply Chain Management**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

This course provides students with a conceptual framework for understanding Supply Chain Management (SCM). The course covers concepts, trends and technologies that enable global SCM. Students will learn how customer needs, competitive advantage, operational measures and financial performance support successful implementation of SCM. They will also learn how operational activities including information systems, procurement, demand planning and forecasting, inventory management and logistics support organizational goals. Students will use software and case studies to illustrate concepts.

**MGMT-546 Project Management**

**400(4)**

Prerequisites: None

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

Managing projects within an organizational context, including the process related to initiating, planning, executing, monitoring, controlling, and closing a project. Coverage of the Project Management Body of Knowledge to support students seeking professional certification. Use of project scheduling software. Development of a project management plan for a student project.

**MRKT-376 Promotional Strategies**

**400(4)**

Prerequisites: MRKT-370

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

This course provides an in-depth examination of the Integrated Marketing Communication alternatives available to a firm. Strategies are analyzed in view of a company's marketing objectives, market conditions, and the competitive environment. A basic objective of the course is to study the variables that will determine an optimal communication "mix".

**MRKT-471 Marketing Management**

**400(4)**

Prerequisites: MRKT-370

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

This course is a hands-on experiential course in which students are able to assimilate both the marketing and management roles within a firm. With the use of an evolving business world marketing and management case computer simulation and classroom activities, small groups (teams)



of students are given the opportunity to manage both the marketing and the related non-marketing aspects of a firm. Emphasis is placed on sorting out and organizing key marketing information, interpreting marketing data, identifying, analyzing, and evaluating marketing problems and opportunities, selecting and developing marketing strategies, and making decisions under conditions of uncertainty.

**MRKT-477 Sales Concepts and Strategies**

**400(4)**

Prerequisites: MRKT-370

Corequisites: None

Minimum Class Standing: JR

Terms Offered: As Needed

A growing demand exists in firms for college-trained sales representatives both in the consumer and business-to-business areas. Thus, this course has two major objectives (a) to explore the variables which must be considered in a relational sales process, and (b) to analyze strategies for developing, implementing, and controlling a company's sales program.

**MUS-380 Music, the Arts, and Ideas**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course is an interdisciplinary study of the relation of music to the history of literature, the fine arts and ideas during a particular style period. Examples of topics which may be covered include, The Foundations of the Baroque, The Enlightenment and Viennese Classicism, Romanticism and Idealism, or The Birth of Modernism.

**PHIL-373 Philosophy**

**400(4)**

Prerequisites: HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course is a study of philosophical inquiry through reading significant works of major philosophers such as Plato, Aristotle, Aquinas, Descartes, Kant, Mill, Buber, and others. The course will cover selected topics in metaphysics and epistemology, morality and ethics, political thought, and aesthetics. The works will be examined from the perspectives of both their historical origin and their contemporary relevance.

**PHIL-378 Moral and Ethical Philosophy**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course is a concentrated study of the origin and nature of standards of character (ethics) and behavior (morality). The history of these concepts will be explored through reading some of the standard philosophical literature. Attention will be given to the difficulties such concepts face in a world now defined by modern ideologies and institutions.

**PHYS-114 Newtonian Mechanics**

**310(3)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: MATH-102 or MATH-102X or MATH-102H, and PHYS-115

Minimum Class Standing: None

Terms Offered: All

A calculus-based introduction to classical Newtonian mechanics including: vectors, translational and rotational kinematics and dynamics, work, energy, impulse, and linear and angular momentum.

**PHYS-115 Newtonian Mechanics Laboratory**

**002(1)**

Prerequisites: MATH-101 or MATH-101X

Corequisites: MATH-102 or MATH-102X or MATH-102H, and PHYS-114

Minimum Class Standing: None

Terms Offered: All

Laboratory activities will explore position, velocity, and acceleration, force, momentum and energy, all as function of time. Applications to vehicle crash safety are incorporated. Laboratory skills, including: uncertainty, simple data acquisition and sensor instrumentation, and analysis techniques are essential.

**PHYS-224 Electricity and Magnetism**

**310(3)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H, and PHYS-114 and PHYS-115

Corequisites: MATH-203 or MATH-203H, PHYS-225

Minimum Class Standing: None

Terms Offered: All

An investigation of the physics of electricity and magnetism with a focus on the physics of electric and magnetic fields and their effects on electric charges. Topics will include the relationships between charges, forces, fields, potentials, and currents, as well as the physics of capacitors, resistors, and inductors.

**PHYS-225 Electricity and Magnetism Laboratory**

**002(1)**

Prerequisites: MATH-102 or MATH-102X or MATH-102H, and PHYS-114, and PHYS-115

Corequisites: MATH-203 or MATH-203H, PHYS-224

Minimum Class Standing: None

Terms Offered: All

This laboratory investigates the physics of electricity and magnetism. It includes a practical study of electric potential and electric current, as well as the fundamental circuit elements: capacitors, resistors, and inductors.

### **PHYS-302 Vibration, Sound, and Light**

**400(4)**

Prerequisites: MATH-203 or MATH-203H, PHYS-224, PHYS-225

Corequisites: MATH-204 or MATH-204H

Minimum Class Standing: SO2

Terms Offered: Summer, Fall

The phenomena of vibration and waves provide a fundamental background necessary to approach a wide variety of applications in physics and engineering. The first part of this course will introduce students to the basics of vibration, including the effects of real damping, response to driving forces, nonlinear oscillation and application to several acoustical, optical, electrical, and mechanical systems. After this introduction to vibration, the course will focus on wave motion. The behavior of non-dispersive waves in solids, acoustic sound waves, electromagnetic waves, and transverse waves on a string will be discussed along with an introduction to Fourier analysis as a means of analyzing wave signals. Non-dispersive waves in non-uniform media will also be explored with applications to several different types of waves occurring in nature. Basic wave phenomena including reflection, refraction, diffraction and interference will be discussed with respect to a variety of wave types. Students successfully completing this course will be well prepared for further study in optics, acoustics, vibration, and electromagnetic wave propagation.

### **PHYS-342 Materials Science & Nanotechnology**

**400(4)**

Prerequisites: CHEM-135 or CHEM-137, PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter, Spring

This course describes the relationship between the structure and properties of metals, semiconductors, ceramic and the materials at the micron and nanoscale size. Important crystal structures, imperfections, defects and diffusion in bulk and nano scale materials are discussed. Characterization techniques, such as X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning Tunneling Microscopy (STM), Atomic Force Microscopy (AFM) are introduced. A brief introduction of quantum mechanics, especially potential well and tunneling through a barrier necessary to understand the behavior of nano size material, is also introduced. Optical properties of the quantum dots, fabrication and applications of MEMS and NEMS, giant magneto resistance (GMR), spintronics, magnetic tunnel junctions and nanophotonics are discussed.

### **PHYS-354 Medical Physics Principles**

**400(4)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Summer, Fall

This course is designed to give physicists, engineers, chemists, pre-med students, and other technical majors an introduction to the application of physics in the field of medicine. Students will be introduced to the fundamental science and real-world application of diagnostic imaging, nuclear medicine, radiation therapy, and health physics. This course will cover topics such as radiation interactions with matter, the concept of radiation dose, the effect of radiation on biology, 2D x-ray imaging, computed tomography (CT) imaging, MRI, ultrasound, biomedical optics, single photon emission computed tomography (SPECT), positron emission tomography (PET), and the treatment of cancer utilizing radiation therapy.

### **PHYS-362 Modern Physics and Lab**

**302(4)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: MATH-204 or 204H

Minimum Class Standing: SO2

Terms Offered: All

This course is an overview of the discoveries and applications of physics from the early 20th century on. Topics include relativity, quantum phenomena, wave-particle duality, quantum physics, solid state physics, semiconductors and superconductors, and nuclear and particle physics. Laboratory experiments will accompany topics introduced in lecture.

### **PHYS-376 Photonics and Optoelectronics**

**400(4)**

Prerequisites: MATH-203, PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: SO

Terms Offered: Winter (even years), Spring (odd years)

The course is intended for all those who want to find out and understand what lasers, fiber optics, and photonic devices are all about without a reliance on rigorous mathematical treatment. This course covers the fundamental aspects of optical fibers. It also provides an introduction to integrated optic devices. Various techniques for the manipulation of laser light based on electro-optic, magneto-optic and acousto-optic effects are described. The course ends with a discussion of optical detection principles and the working of a solar cell. While the level of prerequisites and mathematical sophistication is intermediate, intense independent learning and academic maturity is expected.

### **PHYS-378 Spectroscopy and Microscopy**

**400(4)**

Prerequisites: PHYS-224, PHYS-225, PHYS-362

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter (odd years), Spring (even years)

This course is an introduction to the spectroscopy and microscopy techniques and instrumentation most widely used in the characterization and imaging of materials, with applications to materials science, chemistry and life-sciences. The topics include optical spectroscopy instrumentation

(light sources, detectors, dispersive elements and instruments) and techniques (UV-VIS, Luminescence, Atomic Emission and Absorption, FTIR and Raman), electronic spectroscopy (XPS-ESCA and Auger), mass spectroscopy (SIMS), optical microscopy, scanning and transmission electron microscopy (SEM, TEM), scanning probe microscopy (AFM, STM, MFM) and combined techniques such as fluorescence microscopy.

**PHYS-388 Acoustics in the Human Environment**

**400(4)**

Prerequisites: PHYS-224, PHYS-225

Corequisites: None

Minimum Class Standing: JR

Terms Offered (online): Fall of even years, Summer of odd years

This course surveys elements in acoustics that involve human factors, including the physiology of hearing, psychoacoustics and sound quality metrics, and the basic signal processing needed for these metrics. Topics in architectural and room acoustics will also explore how we experience and control our acoustic environment. While the level of prerequisites and mathematical sophistication is intermediate, intense independent learning and academic maturity is expected. Computer software will be used to manipulate audio signals and understand processing that is often automated (and used carelessly). In this course, less emphasis will be placed on technical practice that may change. Instead, students will be challenged to understand why standards are written as they are, how metrics are designed, and how "rules of thumb" originated.

**PHYS-412 Theoretical Mechanics**

**400(4)**

Prerequisites: MATH-204 or MATH-204H, PHYS-114

Corequisites: None

Minimum Class Standing: None

Terms Offered: Winter, Spring

A look at classical physics. Topics include the projectile motion with air resistance, simple harmonic and nonlinear oscillation, central force motion, Kepler's laws and planetary motion, motion in noninertial reference frames, motion of systems of particles, rigid body motion, Lagrangian mechanics, and Hamiltonian theory. Computational methods for solving advanced physics problems will also be introduced.

**PHYS-452 Thermodynamics and Statistical Physics**

**400(4)**

Prerequisites: MATH-203 or MATH-203H, PHYS-224, PHYS-225

Corequisites: MATH-204 or MATH-204H, PHYS-362

Minimum Class Standing: SO2

Terms Offered: Summer (odd years), Fall (even years)

This course is designed to introduce the student to statistical approaches for the analysis of systems containing a large number of particles. Specific topics include the fundamentals of thermodynamics, conditions for equilibrium and stability, ensemble theory, non-interacting systems, and phase transitions.

**PHYS-462 Quantum Mechanics**

**400(4)**

Prerequisites: MATH-204 or MATH-204H, PHYS-362

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer (even), Fall (odd)

This course introduces students to the fundamentals of non-relativistic quantum mechanics. Topics include: photons, matter waves, the Bohr model, the time-independent Schrodinger equation (and its application to one dimensional potentials), quantization of angular momentum, spin, the hydrogen atom, multi-electron atoms, and perturbation theory.

**PHYS-464 Nuclear Physics: Principles and Applications**

**400(4)**

Prerequisites: CHEM-135 or CHEM-137, PHYS-224, PHYS-225, PHYS-362

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Winter (even years), Spring (odd years)

This course discussed the nuclear structure, nuclear instability, and nuclear reactions. It also discusses various detectors and instruments, including gas detectors, proportional counters, Geiger counters, scintillation detectors and particle accelerators. The biological effects of radiation and its industrial applications in tracing, gauging, materials modification, sterilizations, and food preservations are also introduced. Course discusses the applications of nuclear physics for diagnosis and treatment in medical sciences including Computer Tomography (CT), Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI) and Radiation Therapy (RT). The course also discusses radioactivity, nuclear fission, fusion, and nuclear reactors. While the level of prerequisites and mathematical sophistication is intermediate, intense independent learning and academic maturity is expected.

**PHYS-477 Optics and Lab**

**302(4)**

Prerequisites: MATH-204 or MATH-204H, PHYS-302

Corequisites: None

Minimum Class Standing: JR

Terms Offered: Summer, Fall

A study of geometrical and physical optics. Topics in geometrical optics include phenomena of reflection, refraction, total internal reflection and their application to imaging systems consisting of lenses and mirrors. Physical optics will start from the electromagnetic wave nature of light and will focus on such wave-like phenomena as optical interference, diffraction, polarization, and dispersion of light. Limited topics in interaction of light with matter, crystal optics, optical properties of materials and their applications in such areas as optoelectronics, photonics and fiber optics will also be addressed. The lab investigates optical component analysis, ray tracing, interferometry, diffraction, polarization, interference, optical fibers and other special topics.

**PHYS-495 Scientific Research in Physics I**

**024(2)**

Prerequisites: 16 credits of PHYS; permission of a Physics faculty member

Corequisites: None

Minimum Class Standing: SR

Terms Offered: All

This initial half of the senior research experience in Physics equips the student with necessary tools for a chosen project with a faculty member. Background literature will be emphasized, including searching databases to build a thorough bibliography. Planning for the research work will involve demonstrating mastery of the necessary lab or computer skills specific to the topic. Opportunities to work with faculty advisors will be coordinated by the Physics Department Head, who will collect proposals from students interested in this course. Regardless of the topic, students will develop skills in planning, executing, and communicating research through one-on-one interaction with faculty.

### **PHYS-496 Scientific Research in Physics II**

**024(2)**

Prerequisites: PHYS-495, permission of a Physics faculty member

Corequisites: None

Minimum Class Standing: SR2

Terms Offered: All

This second half of the senior research experience in Physics allows students time to conduct, reflect upon, and communicate work done under the mentorship of a Physics faculty advisor. The prerequisite course (PHYS-495) is designed for planning and background efforts. Critical thinking and clear communication of results is emphasized. Regardless of the topic, students will develop skills in planning, executing, and communicating research through one-on-one interaction with faculty.

### **SOC-332 Contemporary Social Problems**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course analyzes how and why particular issues become identified and defined as a problem in society. Cases investigated are selected from broad areas such as global interconnections, institutional crises, inequalities, and environmentalism. Competing accounts of problems are examined for what they tell us about the causes of, interconnections between and possible solutions to the identified problems.

### **SOC-335 Analysis of Social Dissent**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course provides a sociological analysis of the causes, processes and consequences of social dissent. Emphasis is placed on the impact of dissent in changing society. Examples will be drawn from the U.S. today, from American history and, for comparison, from other times and societies.

### **SOC-336 Sociology of the Family**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: All

This course is a sociological study of the American family system in comparative and historical perspective. It deals with connections between the family as an institution and other aspects of U.S. society such as inequalities of social class, race and gender; government policies, the organization of work, and demographic shifts.

### **SOC-337 Religion in Society**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

A study of the relationships between religion and society. A broad range of religious practices and beliefs selected from diverse human societies will be examined using social scientific perspectives.

### **SOC-338 Gender and Society**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course is a study of social expectations concerning men's and women's behavior, personalities, and abilities. These gendered expectations influence both private, intimate relationships and the roles found in social institutions such as education and work. Several perspectives that explain the origins of these expectations and changes in them are explored.

### **SSCI-201 Introduction to the Social Sciences**

**400(4)**

Prerequisites: COMM-101

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This course will offer a broad comparative study of the nature of human experience, how social scientists study that experience, and some of their findings. It will consider moral and ethical issues (in society and in studying society). It will examine selected topics for what they teach us

about society in general, our present society, or social science. The topics selected will vary from term to term but will include contemporary issues within such areas as science and technology, religion, politics, the environment, and human conflict.

**SSCI-314 Technology and Sustainable Development**

**400(4)**

Prerequisites: COMM-101, HUMN-201, SSCI-201

Corequisites: None

Minimum Class Standing: SO

Terms Offered: As Needed

This course explores meaningful ways in which technology projects could be used to promote sustainable development in developing countries. Students will be introduced to concepts related to both development and sustainability and to a range of economic and social contexts in which development projects are implemented at the local and national levels. The course encourages interdisciplinary approaches to issues of sustainability, appropriate technology, and cultural awareness in selecting, designing, and implementing technologies for sustainable development.

**THS-2 Thesis Project**

**4 Credits**

Prerequisites: None

Corequisites: None

Minimum Class Standing: None

Terms Offered: All

This required individual project provides the senior student the opportunity to apply his or her academic and co-op work experience to a realistic problem. A thesis documenting the project must be completed. The project usually is carried out at the student's employment. The Thesis 1, initiation, carries no credits, and is registered when the project is approved and assigned. The Thesis 2, completion, carries 4 credits and is registered in one of the last two terms of a Kettering student's educational career.

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## Endowed Chairs

Endowed chairs are among the traditional hallmarks of the best institutions of higher education and Kettering University is particularly proud to have been singled out for five such chairs since its independence. Outstanding teacher/scholars are named to hold these distinguished positions--to the benefit of students throughout the University.

The Frances Willson Thompson Chair of Leadership Studies was established by Mrs. Thompson of Flint, Michigan. It memorializes the role that members of her family have played in the development of American industry, particularly William C. Durant and Governor Henry Howland Crapo.

The Eugene W. Kettering Chair of Power Engineering, was endowed by the Kettering Fund of Dayton, Ohio, in honor of Eugene W. Kettering who had a distinguished career in the field of diesel locomotion and was a prominent philanthropist.

The F. James McDonald Chair of Industrial Management was endowed by nearly 700 GM dealers throughout the United States in honor of Mr. McDonald's many contributions to the automotive industry. A 1944 graduate of GMI/Kettering, Mr. McDonald is retired president of General Motors Corporation.

The Alfred Grava Chair in Manufacturing Management was endowed by Dr. and Mrs. Martin (Skip) Walker to honor the late Al Grava. Walker, a 1954 GMI graduate and former chairman/CEO of the M.A. Hanna Company, and Grava, a 1957 GMI graduate and former president of Masco-Tech Automotive Systems Group, were classmates at GMI and lifelong friends.

The Robert and Claire Reiss Chair of Industrial Engineering was established by Robert E. Reiss and his wife Claire. Bob is a 1960 Industrial Engineering graduate and former member of the university's Board of Trustees. He was President and CEO of Interventional Technologies, a company he founded and later sold to Boston Scientific. The chair focuses on both teaching and research within an area of concentration relating to industrial engineering.

## Emeritus Faculty

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