



Parks College utilizes the Math-Index to place students

evaluation, the Chief Instructor will recommend either some remedial training or continuation to the next level of training. Ground school courses completed at a Part 141 flight school may be transferable; those completed at a Part 61 flight school may not be transferable. Early consultation with the department chair and/or the Chief Instructor is strongly recommended.

#### **TS/ Re i eme**

The Transportation Security Administration (TSA) requires any individual applying for flight training to provide proof of citizenship prior to beginning the training. New student pilots will be unable to begin flight training until the proof of citizenship requirement is met. Pilots typically provide 1) the individual's valid, unexpired U.S. passport or 2) the individual's original or government-issued certified U.S. birth certificate, together with a government-issued picture identification of the individual. Other TSA-specified documents may be accepted. Non-U.S. citizens must receive TSA approval prior to beginning any flight training. Please contact the Flight Training Director's office for additional information.

#### **4/ e da ce**

As a policy, undergraduate students are expected to regularly attend all classes, laboratory sessions and examinations. The implementation of this policy is left to the discretion of the individual instructor with the following exception: no absences are permitted in any course that is required for the Federal Aviation Administration (FAA) regulated pilot certification courses. FAA regulations specify the number of credits required in the approved programs. Students should contact the academic departments for details of these regulations.

If any absences occur, it is the student's responsibility to make up the missed work. Since the student is expected to regularly attend classes, the instructor is not obligated in any way to provide make-up examinations or additional help on material covered when a student is absent.

When, in the judgment of the instructor, a student has accrued an excessive number of absences, the instructor may report this as an early warning notification to the student and his/her academic advisor. At the discretion of the instructor, a grade of "F" (failure in course) may be given.



Humanistic Values course. Students should always consult with their department chair prior to the semester of study at another institution.

**Capstone Experience (minimum of 3 credits)**

A senior-level course or sequence of courses providing opportunities for students to use their acquired and accumulated knowledge on a problem or in a setting that is representative of that found in the profession.

**BACHELOR-MASTER'S DEGREE AND DOUBLE MAJOR OPTIONS**

**Overview**

The Bachelor's-Master's degree option allow for a student to earn both degrees in a unified sequence. Students interested in this program can apply for admission to the graduate program in their junior year. Admitted students are then allowed to take graduate courses up to six credits towards their M.S. degree in their senior year and these courses cannot be used to satisfy undergraduate degree requirements.

**Program Requirements**

The bachelor's-master's option requires completion of the standard requirements for a M.S. degree in addition to completion of the standard requirements of a B.S. degree. The M.S. degree requires 30 credits course work, of which up to 9 credits may be research credit. Up to 9 credits may be course work at the 4000 level; the remaining course credits must be at the 5000 level or above. For course only option, 30 credits of course work is required. Specific programs of study for each student are developed under the guidance of a faculty





**A/ e ace E gi ee i g C e (39 c edi )**

|      |      |                                   |   |
|------|------|-----------------------------------|---|
| AENG | 1001 | Intro to Aerospace/Mechanical Eng | 1 |
| AENG | 1002 | Computer Aided Engineering Des    | 1 |
| AENG | 2000 | Intro to Aero & Astro             | 3 |
| AENG | 3000 | Performance                       | 3 |
| AENG | 3100 | Computer Aided Engineering        | 3 |
| AENG | 3150 | Astroynamics                      | 3 |
| AENG | 3210 | Gas Dynamics                      | 3 |



societal context;

i. a recognition of the need for, and an ability to

- + ACT/SAT: ACT composite score of 24 or higher, or SAT composite score of 1160 or higher. ACT sub scores minimums of 22 in English, 24 in Mathematics, 22 in Reading Comprehension and 22 in Scientific Reasoning, or SAT Math sub score of 620.
- + Coursework: Fifteen total units of high school work are required: three or four units of English; four or more units of mathematics including algebra I and II, geometry and precalculus (Algebra II with Trigonometry is not sufficient). Students should be prepared to start the first semester freshmen year in Calculus I or higher; three or four units of science including general science, introduction to physical science, earth science, biology, physics or chemistry; two or three units of social sciences including history, psychology or sociology; and three units of electives.

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There are two principal ways to help finance a Saint Louis University education:

+

Social & Behavioral Sciences courses include

Anthropology, Communication, Communication  
Sciences Disorders, Criminology and Criminal Justice,  
Economics, Education, Political Science, Psychology,  
Sociology, Social Work,

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Grades in all MENG/ESCI courses must be C or better.

Students must maintain a minimum 2.00 GPA.



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- C. Work effectively on multi-disciplinary and diverse teams
- D. Make professional and ethical decisions
- E. Communicate effectively, using both written and oral communication skills

includes the necessary coursework and experience to



student's arrival on campus. For specific information regarding the examination, visit the FAA online at [faa.gov/pilots/amelocator](http://faa.gov/pilots/amelocator). Early application for admission to the flight science program is strongly encouraged as capacity may be limited.

International students will be evaluated for their listening comprehension and spoken ability in addition to meeting regular English requirements. Prior to commencing flight instruction, special training will be required for those students found deficient in this evaluation.

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. To be considered for admission to any Saint Louis University undergraduate

### FSCI 2150 Flight 3 and Lab

This course provides 41.0 hours in an aircraft and 14.5 hours in an aircraft training device.

### FSCI 2550 Flight 4 and Lab

This course provides 42.0 hours in an aircraft and 14.5 hours in an aircraft training device.

### FSCI 3550 Flight 5 and Lab

This course provides 40.0 hours in an aircraft and 10.5 hours in an

|          |      |                          |   |
|----------|------|--------------------------|---|
| PSY      | 1010 | General Psychology       | 3 |
| THEO     | 1000 | Theological Foundations  | 3 |
| <b>K</b> |      | <b>ledge (10 c edi )</b> |   |
| CIS      | 1300 |                          |   |

a letter grade of C. Any student receiving a single C-, D, F, or U grade in a course with an ASCI or FSCI prefix that is required for graduation in an Aviation Management or Flight Science major or minor will be required to repeat the course in which the C-, D, F, or U grade was received. If the course is a prerequisite to another course in the Aviation Management or Flight Science program, the student will be required to repeat the course in which the C-, D, F, or U grade was received. The student will not be allowed to progress into the subsequent course until a grade of C is achieved in the prerequisite course.

Students enrolled in the Flight Science minor are allowed two (2) attempts to earn a grade of C or better in any of the flight courses that are part of the academic program. A student receiving a C-, D, F, or U grade in a repeated course is subject to dismissal from the program.

An appeal of a grade, progression in the program, or dismissal from the program may be made in accordance with the procedures outlined in the Department of Aviation Science Student Appeal Process, a copy of which can be obtained from the department chairperson or from the Parks College of Engineering, Aviation and Technology Office of the Dean.

Students should be aware that situations such as those described above could jeopardize one's planned graduation date due to the manner in which courses are scheduled each academic year.

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The Master of Science in aviation provides a competitive and rigorous program that prepares graduates for leaderships roles within the aviation industry. The program is well-suited for the working professional as 100% of the courses are taught online, with the exception of a 2-credit internship requirement. The coursework provides a strong foundation and prepares students to perform aviation-related up-to-date research, all of which positions the student for a successful career in a wide variety of aviation positions.

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The program consist of 32 credits of graduate-level coursework

fall semester. To be considered for enrollment in the fall semester, students should submit their application materials by May 31.

Admitted students who want to be considered for an assistantship must submit a separate application for assistantship consideration by March 1.

**Re\_i\_e P\_c\_e**

Once all the materials are received and the online application is complete, the application is reviewed by the Parks College Office of Graduate Education and Research before being sent to the aviation department for a recommendation. The final decision is made by Parks' director of graduate programs.

Admissions decisions are made based on the background and educational experience of students. Applications are reviewed when completed, and decisions are generally made within a few weeks.

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Parks College offers graduate fellowship awards and a

materials by May 31.

Admitted students who want to be considered for an assistantship must submit a separate application for assistantship consideration by March 1.

**Re ie P ce**

Once all the materials are received and the online application is complete, the application is reviewed by the Parks College Office of Graduate Education and Research before being sent to the aviation department for a recommendation. The final decision is made by Parks' director of graduate programs.



- h) the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- i) a recognition of the need for, and an ability to engage in life-long learning;
- j) a knowledge of contemporary issues;
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;
- l) an understanding of biology and physiology, and the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology;
- m) an ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.

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In addition

|     |      |                            |   |
|-----|------|----------------------------|---|
| BME | 4650 | Quantitative Physiology II | 3 |
| BME | 4980 | Independent Research       | 3 |

**BME-Related General Elective (9 credits)**

BME-Related general electives should be selected in accordance with the student's long-term educational and career goals. Often, students use these credits for advanced work in math, science, and engineering. However, students may also select courses designed to broaden their education in areas such as liberal arts or business. In all cases the permission of the academic advisor and Department Chairperson is required. Under no circumstances can prerequisite courses be used as general electives, e.g., Pre-Calculus (MATH 1400) or The Process of Composition (ENGL 1500).

**TOTAL CREDITS: 124**

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Students must maintain a minimum 2.00 GPA.

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The minor requires 18 credits of coursework including a course in physiology (e.g., BIOL 2600, PPY 2540 Human Physiology or BME 2200) and at least five BME courses. At least three of the BME courses must be selected at the 4000-level, i.e., from the Advanced BME courses.

To initiate a Minor in BME, a student should file a "Minor in BME" plan with the BME Department after meeting with a BME Faculty member to discuss the minor courses and their prerequisites. The "Minor in BME" form serves as a planning tool and that will be on file in the BME Department and with the student's academic advisor in the major area. The completion of a Minor in BME must be certified by the Chair of the BME Department as part of the graduation check.

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The grades in all BME courses must be C or better.

Students must maintain a minimum 2.00 GPA.

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Ronaldo Luna, Ph.D., P.E.

*Department Chair*

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The civil engineering program provides a solid foundation of coursework in the engineering sciences, including structural, environmental, geotechnical, hydraulic and transportation engineering. Solid mechanics, fluid sciences and graphics are also covered.

Modern and well-equipped laboratories emphasize experimental methods and measurement techniques.

The civil engineering program includes the following primary focus areas:

- Green and sustainable design
- Infrastructures design, evaluation and restoration
- Transportation planning, modeling and design
- Hydraulic and water resources modeling and design

In addition, students are exposed to entrepreneurship and the entrepreneurial mindset through the curriculum and extracurricular opportunities.

### K"1)5%/&

Craig Adams, Ph.D., P.E.

Christopher Carroll, Ph.D., P.E.

Amanda Cox, Ph.D., P.E.

Riyadh Hindi, Ph.D., P.Eng.

Jalil Kianfar, Ph.D., P.E.

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### @I JGI @@EGI J&&





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### ' @OD@E! F6=&

William J. Ebel, Ph.D.  
Department Chair

### K"1)5%/&

Roobik Gharabagi, Ph.D.  
Armineh Khalili, M.S.E.E.  
Huliyar S. Mallikarjuna, Ph.D.  
Kyle Mitchell, Ph.D.  
Habib Rahman, Ph.D.

## Hv@EV6@W&

The Department of Electrical and Computer Engineering offers two undergraduate programs leading to the degree of Bachelor of Science in Electrical Engineering or Computer Engineering. The department provides programs that incorporate analysis, design and development of electrical, electronic, and computer systems, and prepares graduates for entry into the profession as productive and effective engineers.

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The undergraduate computer engineering program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

### Program Educational Objectives

The undergraduate program is designed to meet the following specific objectives in order to fulfill the departmental and institutional missions.

- Our graduates will have acquired advanced degrees or are engaged in advanced study in engineering, business, law, medicine or other appropriate fields.
- Our graduates will have established themselves as practicing engineers in electrical, computer or related engineering fields.
- Our graduates will be filling the technical needs of society by solving engineering problems using electrical or computer engineering principles, tools, and practices.

### Student Outcomes

Student outcomes are defined by ABET as the skills that graduates will attain at the time of graduation. Student outcomes are listed below:

- a. an ability to apply knowledge of mathematics, science, and engineering;
- b. an ability to design and conduct experiments, as well as to analyze and interpret data;
- c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
- d. an ability to function on multi-disciplinary teams;
- e. an ability to identify, formulate, and solve engineering problems;
- f. an understanding of professional and ethical responsibility;
- g. an ability to communicate effectively;
- h. the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- i. a recognition of the need for, and an ability to engage in life-long learning;
- j. a knowledge of contemporary issues;
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.



**Liberal/ Re i eme (15 c edi )**

|   |   |
|---|---|
| PHIL 3400 Ethics and Engineering  | 3 |
| THEO 1000 Theological Foundations   | 3 |
| Cultural Diversity  | 3 |
| Humanities  | 3 |
| Social & Behavioral Science   | 3 |
| Cultural Diversity, Humanities, Social and Behavioral Science must be selected from an approved list. |   |

**C m e E gi ee i g C e (48 c edi )**

|                                      |   |
|--------------------------------------|---|
| ECE 1001 Intro to ECE I              | 1 |
| ECE 1002 Intro to ECE II             | 1 |
| ECE 2101 Electrical Circuits I       | 3 |
| ECE 2102 Electrical Circuits II      | 3 |
| ECE 2103 Electrical Circuits Lab     | 1 |
| ECE 2205 Digital Design              | 3 |
| ECE 2206 Digital Design Lab          | 1 |
| ECE 3205 Advanced Digital Design     | 3 |
| ECE 3215 Computer Systems Design     | 3 |
| ECE 3216 Computer Systems Design Lab | 1 |
| ECE 3217 Computer Architecture       | 3 |
| ECE 3225 Microprocessors             | 3 |
| ECE 3226 Microprocessors Lab         | 1 |
| ECE 3130 Semiconductor Devices       | 3 |
| ECE 3131 Electronic Circuits         | 3 |
| ECE 3132 Electronic Circuits lab     | 1 |
| ECE 3150 Linear Systems              | 3 |
| ECE 3151 Linear Systems Lab          | 1 |



The department offers a unique undergraduate program culminating in a Bachelor of Science in electrical

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**W i e a d O a l C m m i c a i ( 3 c e d i )**

ENGL 1920 Adv Writing for Professionals 3

**C m e S c i e c e ( 3 c e d i )**

CSCI 1060 Intro to Scientific Programming 3

**Libe al/ Re i e m e ( 15 c e d i )**PHIL 3400 Ethics and Engineering 3  
THEO 1000 Theological Foundations 3  
Cultural Diversity 3

Humanities 3

Social &amp; Behavioral Science 3

Cultural Diversity, Humanities, Social and Behavioral Science must be selected from an approved list.

**Elec i c a l E g i e e i g C e ( 41 c e d i )**

ECE 1001 Intro to ECE 1 1

ECE 1002 Intro to ECE II 1

ECE 2101 Electrical Circuits I 3

ECE 2102 Electrical Circuits II 3

ECE 2103 Electrical Circuits Lab 1

ECE 2205 Digital Design 3

ECE 2206 Digital Design Lab 1

ECE 3225 Microprocessors 3

ECE 3226 Microprocessors Lab 1

ECE 3130 Semiconductor Devices 3

ECE 3131 Electronic Circuit Design 3

ECE 3132 Electronic Circuit Design Lab 1

ECE 3140 Electromagnetic Fields 3

ECE 3150 Linear Systems 3

ECE 3151 Linear Systems Lab 1

ECE 3090 Junior Design 1

ECE 4120 Automatic Control Systems 3

ECE 4800 ECE Design I 3

ECE 4810 ECE Design II 3

**B i m e d i c a l E g i e e i g C e ( 9 c e d i )**

BME 2000 BME Computing 3

BME 3150 Biomedical Instrumentation 3

BME 4100 Biomedical Signals 3

|            |      |                                 |   |
|------------|------|---------------------------------|---|
| BME        | 2000 | BME Computing                   | 3 |
| <b>BME</b> |      | <b>ECE Elec i e (3 c edi )</b>  |   |
| BME        | 3150 | Biomedical Instrumentation      | 3 |
| BME        | 4100 | Biomedical Signals              | 3 |
| BME        | 4200 | Biomechanics                    | 3 |
| BME        | 4300 | Biotransport                    | 3 |
| BME        | 4310 | Advanced Topics in Biotransport | 3 |
| BME        | 4400 | Biomaterials                    | 3 |
| BME        | 4410 | Tissue Engineering              | 3 |
| BME        | 4500 | Numerical Methods in BME        | 3 |
| BME        | 4600 | Quantitative Physiology I       | 3 |
| BME        | 4650 | Quantitative Physiology II      | 3 |
| BME        | 4980 | Independent Research            | 3 |
| ECE        | 3110 | Energy Conversion               | 3 |
| ECE        | 3140 | Electromagnetic Fields          | 3 |
| ECE        | 4225 | Hardware Software Co-design     | 3 |
| ECE        | 4226 | Mobile Robotics                 | 3 |
| ECE        | 4235 | Digital IC Design               | 3 |
| ECE        | 4151 | Digital Signal Processing       | 3 |

**TOT/ L CREDITS: 130**

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Students must maintain a minimum 2.00 GPA.

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William D. Thacker, Ph.D.  
*Department Chair*

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The Department of Physics offers two undergraduate degrees in Physics: the Bachelor of Science (B. S.) degree for students enrolled in Parks College and the Bachelor of Arts (B. A.) degree for students in the College of Arts and Sciences. The department also offers a Bachelor of Science (B. S.) degree in Engineering Physics for students enrolled in Parks College. In addition, the department offers Minors in Physics, useful primarily to students majoring in mathematics, computer science, engineering fields, and other sciences. Major-minominssajetdenpajysmicmand

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understanding of natural phenomena, analytical and computer skills, experience with electronics and the operation of sophisticated equipment, an understanding of measurements and their limitations, and the ability to formulate and solve technical problems.

Physics students have a strong interest in mathematics, computers and science along with a desire to understand how the universe works. Students are interested in questions such as "Why do elementary particles behave the way they do?", "What is the nature of light?" or "How did the universe begin, and what will eventually happen to it?" Some students pursue double majors in mathematics, computer science or an engineering field.

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The B.S. in physics from Parks College stresses physics and its applications in areas such as engineering, computers and the sciences, and also includes opportunities to participate in faculty research.

Students of the physics program gain a solid foundation in analytical, computational and laboratory skills through course work in mathematics, computer science and physics. The physics curriculum includes courses in classical mechanics, quantum mechanics, electricity and magnetism, thermodynamics and statistical mechanics, as well as optics, electronics and modern physics.

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Benefits of the physics program also include several internship and career opportunities. The physics department employs some of its students as teaching and research assistants during the summer. Students have held summer internships at NASA-Langley, the Argonne National Laboratory and other laboratories. Students have worked both during the summer and during the year at local industries such as Boeing and Anheuser-Busch. Numerous opportunities exist for summer research in basic and applied physics in the Parks Summer Undergraduate Research Experience (SURE) program and in national laboratories and in National Science Foundation-sponsored programs at universities throughout the United States.

The programs stresses undergraduate research and applications of computers in physics. New state-of-the-art research facilities allow for students to

|      |           |                                       |   |
|------|-----------|---------------------------------------|---|
| PHYS | 1110      | Introduction to Physics (as a career) | 1 |
| CHEM | 1110/1115 | General Chemistry I/Lab               | 4 |
| PHYS | 1610/1620 | Engineering Physics I/Lab             | 4 |
| PHYS | 1630/1640 | Engineering Physics II/Lab            | 4 |



has brought such revolutions as relativity, quantum mechanics and the Big Bang theory, profoundly altering the way mankind views the universe.

Physicists have played a major role in the discovery of many phenomena leading to whole new technologies. The invention of the transistor, by physicists, has made the modern computer possible, while the development of lasers has led to diverse applications ranging from supermarket scanners to laser surgery. The physicist is a versatile problem solver and able to excel in many technical fields.

A training in physics leads to a broad-based understanding of natural phenomena, analytical and computer skills, experience with electronics and the operation of sophisticated equipment, an understanding of measurements and their limitations, and the ability to formulate and solve technical problems.

Physics students have a strong interest in mathematics, computers and science along with a desire to understand how the universe works. Students are interested in questions such as "Why do elementary particles behave the way they do?", "What is the nature of light?" or "How did the universe begin, and what will eventually happen to it?" Some students pursue double majors in mathematics, computer science or an engineering field.

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The B.S. in physics from Parks College stresses physics and its applications in areas such as engineering, computers and the sciences, and also includes

loans, some of which require repayment.

For priority consideration for merit-based scholarships, applicants should apply for admission by Dec. 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

For information on other scholarships and financial aid, visit the student financial services office online at [finaid.slu.edu](http://finaid.slu.edu).

|   |   |
|---|---|
| AENG 2000 Intro.to Aeronautics& Astronautics      | 3 |
| AENG 3000 Performance                             | 3 |
| AENG 4400 Stability & Control                     | 3 |
| Two Upper Division Courses (AENG/ESCI 3xxx, 4xxx) | 6 |

**Astronautics**

|   |   |
|---|---|
| AENG 2000 Intro.to Aeronautics and Astronautics   | 3 |
| AENG 3150 Astrodynamics                           | 3 |
| AENG 4150 Orbital Mechanics                       | 3 |
| Two Upper Division Courses (AENG/ESCI 3xxx, 4xxx) | 6 |

**Se i De ig P jec (6 c edi )**

|   |   |
|---|---|
| AENG 4004 Flight Vehicle Analysis & Design I  | 3 |
| AENG 4014 Flight Vehicle Analysis & Design II | 3 |

**C llege C e (22 c edi )**

|  |   |
|--|---|
| ENGL 1900 Adv. Rhet. & Research or 1920 Adv. Writing | 3 |
| CMM 2200   |   |

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assessed through a portfolio process by the housing department.

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The master's degree in engineering requires a minimum of 30 credits beyond a bachelor's degree. If students pursue an option in research, six of the total credits to the degree must be in thesis research. If students pursue the project option, three of the total credits for the degree must be devoted to carrying out a project, approved by a faculty adviser.

The engineering M.S. also allows students to customize a program of study to meet professional goals. This program, which will also take into account the academic background of students, must be approved by a faculty adviser, the department chair and the associate dean for graduate education at Parks College.

There are five concentrations in the engineering master's program:

- + Aerospace and mechanical engineering
- + Biomedical engineering
- + Civil engineering
- + Electrical and computer engineering
- + Engineering physics

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The expert faculty of Parks College collaborate with graduate students in ground-breaking research in the following areas:

- + Aircraft engine aerodynamics
- + Cardiovascular and assist devices
- + Energy, sustainability and environmental
- + Engineering education
- + Flight control systems
- + Haptic and human-machine interfaces
- + Human factors/physiology
- + Innovation and entrepreneurship
- + Medical robotics
- + Orthopedic biomechanics
- + Regenerative medicine
- + Robotics and mechatronics
- + Safety
- + Sensors and systems
- + Signal processing
- + Space systems
- + Structures and bridges
- + Thermal-fluid sciences

assistantships each year. Assistantships provide tuition, stipend and health insurance. There are also many opportunities for students to receive funding through external research grants that are managed by individual faculty.

For more information, visit the student financial services office online at [finaid.slu.edu](http://finaid.slu.edu).

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Students choose one of three options for their Master of Science

- + course only
- + project option
- + thesis option

For students pursuing the research option, 6 of the total credits to the degree must be in Thesis Research. For students pursuing the project option, 3 of the total credits to the degree must be devoted to carrying out a project, approved by students' Faculty Advisor.

M.S. students prepare a program of study that must be approved by the Faculty Advisor, department chair, and the Parks College Graduate Programs Director. This program of study is developed within the context of background and career goals of students allowing them to customize their program to suit their professional goals.

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**The i i**

First Semester in the M.S. Program

In the first semester, M.S. students will begin taking courses as indicated in the program of study. In parallel, students may also begin research in an identified research area, under the guidance of a Faculty Advisor.

The Faculty Advisor and student will form a Guidance





The Engineering Ph.D. degree requires a total of 60 credits beyond the bachelor's degree with a minimum of 12 credits of dissertation research. Of the 60 credits, a maximum of 9 credits may be comprised of coursework at the 4000-level; all other course credits must be at the 5000 or 6000-level. Those students who earn a Master of Science degree may include up to 24 credits from the associated Master of Science degree, but not the thesis or project credits, in the 60 credits which are needed for the Ph.D. degree. Ph.D. students should also satisfy four semesters of Graduate Seminar beyond