INTEGRATED AND APPLIED SCIENCES, PH.D.

Saint Louis University's Integrated and Applied Sciences (IAS) doctoral program was established to broaden student exposure to all areas of science, encourage collaboration across departments and colleges, and better train graduate students to present their research to a more diverse audience.

Program Highlights

- This interdisciplinary program is large enough to provide students with broad exposure to collaborative scientific projects, yet small enough for students to have one-on-one interaction with their faculty mentor.
- This personalized approach is necessary for developing the communication skills that will enhance employment opportunities for students and, in keeping with SLU's Jesuit tradition, endow them with tools to better contribute to society.
- Students specialize in a concentration depending on their primary mentor's research area. Concentrations include biology, chemistry, environmental science and GIS, health sciences, and physics.

Leadership

Vasit Sagan, Ph.D.
Program Director

Curriculum Overview

Saint Louis University's Doctor of Philosophy in Integrated and Applied Sciences (IAS) utilizes interdisciplinary approaches and collaboration within the fields to prepare graduates to confidently assume multifaceted roles in the changing scientific community.

The distribution of courses in the various IAS areas is determined by the student's dissertation committee with a minimum total of 30 credits between all three areas. A total of 42 credits are required with the remaining 12 credits coming from dissertation credits. An appropriate coursework track is developed by the student and their mentor with subsequent approval by the IAS administrative committee. A typical coursework structure includes:

- Participating departmental core courses (9–12 credits)
- Interdisciplinary credits (18–21 credits)
- Dissertation credits (12 credits)

Biology Concentration

This concentration is geared toward biological research with bioinformatics or integrated geospatial biology. Required core courses may be taken in the SLU's Department of Biology (https://www.slu.edu/arts-and-sciences/biology/).

Chemistry Concentration

This concentration is for students interested in chemical research with substantial overlap with other biological or physical science and engineering disciplines.

Environmental Sciences and GIS Concentration

This concentration is for students interested in the application of geographic information systems (GIS) in the field of environmental sciences. Required courses are taken in SLU's Department of Earth and Atmospheric Sciences (https://www.slu.edu/arts-and-sciences/earth-atmospheric-sciences/), as well as the GIS program (https://catalog.slu.edu/colleges-schools/arts-sciences/earth-atmospheric-sciences/geographic-information-science-ms/?_ga=2.151043833.1339926385.1586191480-1836301299.1581545667/).

Health Sciences Concentration

This concentration prepares students to become scholars and researchers within academic, clinical research, and practice settings by conducting interdisciplinary studies of biological, behavioral, psychosocial and environmental aspects of human health. Required courses are taken in Doisy College of Health Sciences (https://www.slu.edu/doisy/).

Physics Concentration

This concentration is geared toward students interested in the physics of solid-state and nanomaterials.

Fieldwork and Research Opportunities

This research-intensive doctoral program will train students for careers in pharmaceutical and biochemical industries, as well as in academia. The program's scientific training takes place in an interdisciplinary environment with biology, biomedical science, chemistry, earth and atmospheric science, engineering, health sciences, and physics faculty.

Careers

This doctoral program trains scientists for careers in academia as well as chemical, biological, environmental and geospatial science industries and health sciences and prepares them to collaborate with other professionals. Scientific training takes place in an interdisciplinary environment with faculty from science departments in SLU's College of Arts and Sciences (https://www.slu.edu/arts-and-sciences/) and Doisy College of Health Sciences (https://www.slu.edu/doisy/).

Admission Requirements

The integrated and applied sciences administrative committee will ensure that the applicant possesses a minimum of a baccalaureate degree from an accredited, recognized college or university in a discipline relevant to the research of the integrated and applied sciences faculty mentor.

Application Requirements

- Application form and fee
- Transcript(s)
- Three letters of recommendation
- Curriculum vitae
- Professional goals statement

Requirements for International Students

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency
- Proof of financial support must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
• Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

Review Process
The integrated and applied sciences administrative committee will ensure that the applicant's previous academic record indicates the ability needed to pursue advanced studies. The committee will then make an admissions recommendation to the graduate admissions department, which is responsible for making the final decision and communicating that decision to both the integrated and applied sciences program director and the applicant.

Scholarships, Assistantships and Financial Aid
For priority consideration for a graduate assistantship, apply by the program admission deadlines listed. Fellowships and assistantships provide a stipend and may include health insurance and a tuition scholarship for the duration of the award.

For more information, visit http://www.slu.edu/financial-aid (http://www.slu.edu/financial-aid/).

Learning Outcomes
1. Graduates will be able to use scientific principles underpinning the primary scientific discipline in which their concentration is based and by applying basic research methodology, demonstrate their application to their particular field of interest (chemistry, biology, physics, environmental science, sustainability science).
2. Graduates will be able to demonstrate advanced creativity in scientific research methodology in their concentration and appropriately use techniques in a laboratory and/or field setting – including experimental, theoretical, and computational methods.
3. Graduates will be able to integrate methods, theories, paradigms, concepts etc. from more than one discipline.
4. Graduates will be able to demonstrate an ability to communicate (oral and written) results and conclusions from their research, describe techniques and methodology used, and apply their experiences in the greater world in which we live.

Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>IAS 6010</td>
<td>Interdisciplinary Seminar (taken over multiple semesters)</td>
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<tr>
<td>IAS 6030</td>
<td>Interdisciplinary Research (taken over multiple semesters)</td>
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</table>

Concentration Courses
Select one of the following concentrations: 1

- Biology Concentration (p. 2)
- Chemistry Concentration (p. 2)
- Environmental Sciences and GIS Concentration (p. 3)
- Health Sciences Concentration (p. 3)
- Physics Concentration (p. 4)

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>BIOL 5700</td>
<td>Advanced Biological Chemistry</td>
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<tr>
<td>BIOL 5190</td>
<td>Geographic Information Systems in Biology</td>
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<tr>
<td>BIOL 5350</td>
<td>Current Topics in Cell Biology</td>
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<tr>
<td>BIOL 5400</td>
<td>Problems in Genetics</td>
<td></td>
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<tr>
<td>BIOL 5480</td>
<td>Conservation Biology</td>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>BIOL 5840</td>
<td>Graduate Seminar in Ecology, Evolution and Systematics</td>
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</tr>
<tr>
<td>BIOL 6150</td>
<td>Neural Basis of Behavior</td>
<td></td>
</tr>
<tr>
<td>BIOL 6970</td>
<td>Research Topics</td>
<td></td>
</tr>
<tr>
<td>BIOL 6980</td>
<td>Graduate Reading Course</td>
<td></td>
</tr>
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<td>BIOL 5820</td>
<td>Graduate Seminar in Cell and Molecular Regulation</td>
<td></td>
</tr>
<tr>
<td>BIOL 5860</td>
<td>Scientific Communication</td>
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Concentration Interdisciplinary Course
Select two to three courses from Earth & Atmospheric Sciences, Engineering, Physics, Mathematics, Chemistry, Biomedical Engineering, or Biomedical Sciences, Center for Sustainability, or GIS courses

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<tr>
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<tr>
<td>CHEM 5160</td>
<td>Advanced Synthetic Chemistry</td>
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<tr>
<td>CHEM 5200</td>
<td>Analytical Chemistry II</td>
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</tr>
<tr>
<td>CHEM 5230</td>
<td>Mass Spectrometry</td>
<td></td>
</tr>
<tr>
<td>CHEM 5260</td>
<td>Analytical Separations</td>
<td></td>
</tr>
<tr>
<td>CHEM 5270</td>
<td>Electroanalytical Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 5300</td>
<td>Mathematical Techniques in Chemistry</td>
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</tr>
</tbody>
</table>

Dissertation Research

<table>
<thead>
<tr>
<th>Code</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>IAS 6990</td>
<td>Dissertation Research (taken over multiple semesters)</td>
<td>12</td>
</tr>
</tbody>
</table>

Total Credits 42

Non-Course Requirements
Assuming successful completion of oral and written comprehensive exams, students should complete the Ph.D. program in four to five years. Students entering the program with an appropriate M.S. degree may complete the program in less time, again assuming successful completion of oral and written comprehensive exams.

Continuation Standards
Students must maintain a cumulative grade point average (GPA) of 3.00 in all graduate/professional courses.

Biology Concentration

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Total Credits 42

† Concentration Core Department (9-12 credits), Concentration Interdisciplinary credits (6–9 credits)
CHEM 5370  Computational Chemistry
CHEM 5390  Special Topics: Physical Chemistry
CHEM 5400  Organic Spectroscopy
CHEM 5440  Bioorganic Chemistry
CHEM 5450  Advanced Organic Chemistry
CHEM 5460  Synthetic Organic Chemistry
CHEM 5470  Principles of Medicinal Chemistry
CHEM 5500  Inorganic Chemistry
CHEM 5550  Organometallic Chemistry
CHEM 5560  Solid State Chemistry
CHEM 5570  Group Theory & Spectroscopy
CHEM 5610  Biochemistry 1
CHEM 5615  Biochemistry 2
CHEM 5620  Biophysical Chemistry
CHEM 5630  Introduction to Chemical Biology and Biotechnology
CHEM 5800  Fundamentals and Design of Nanomaterials
CHEM 5299  Introduction to Analytical Research
CHEM 5399  Introduction to Physical Research
CHEM 5499  Introduction to Organic Research
CHEM 5599  Introduction to Inorganic Research

Concentration Interdisciplinary Course
Select two to three courses from Earth & Atmospheric Sciences, Engineering, Physics, Mathematics, Chemistry, Biomedical Engineering, or Biomedical Sciences, Center for Sustainability, or GIS courses. Students should register for CHEM 5920 Research Seminar (1 cr) each semester of their first two years before registering for IAS 6010 Interdisciplinary Seminar (1 cr) in years 3 and 4.

Total Credits: 15-21

Environmental Sciences and GIS Concentration

Code  Title  Credits

Concentration Core Department
Select three to four of the following: 9-12
EAS 5190  Seminar in Geoscience
EAS 5900  Geoscience Journal Club
EAS 5170  Divergent & Convergent Margins
EAS 5180  Trans Margins & Plate Interior
EAS 5600  Atmospheric Chemistry
GIS 5010  Introduction to Geographic Information Systems
GIS 5040  Introduction to Remote Sensing
GIS 5070  Research Methods
GIS 5080  Digital Cartography and Geovisualization
GIS 5090  Introduction to Programming for GIS and Remote Sensing
GIS 5091  Advanced Programming for GIS and Remote Sensing
GIS 5092  Machine Learning for GIS and Remote Sensing
GIS 5100  Microwave Remote Sensing: SAR Principles, Data Processing and Applications
EAS 5410  Hydrology
GIS 5970  Research Topics

Concentration Interdisciplinary Course
Select two to three of the following: 6-9

BIOL 5190  Geographic Information Systems in Biology
BIOL 5480  Conservation Biology
BSDP 5101  Fundamentals of Disaster Planning
EOH 5970  Research Topics in Environmental and Occupational Health
EAS 5340  Cloud Physics

Total Credits: 15-21

Health Sciences Concentration

Code  Title  Credits

Concentration Core Department
HSCI 6200  Seminar in Health Sciences Research 1

Choose remaining concentration core department courses from among:

BLS 5125  Introduction to Clinical Laboratory Medicine
CSDI 5450  Speech Sound Disorders in Children
CSDI 5510  Social Communication Development and Disorders
CSDI 5550  Early Childhood Language Disorders
CSDI 5560  School-Age Language Disorders
CSDI 5630  Dysphagia
CSDI 5700  Voice Disorders
CSDI 5710  Cleft Palate and Craniofacial Anomalies
CSDI 5720  Neurogenic Communication Disorders in Adults
CSDI 5760  Motor Speech Disorders
CSDI 5770  Multicultural Assessment and Management of Communication Disorders
CSDI 5820  Cognitive Communication Disorders
CSDI 5930  Special Topics
DIET 4060  Maternal and Child Nutrition & Health
DIET 4100  Medical Nutrition Therapy I
DIET 4150  Medical Nutrition Therapy II
DIET 4300  Foundations in Comm. Nutrition
DIET 4400  Nutrition Education
DIET 4500  Nutrition Counseling
DIET 4980  Independent Study
DIET 5010  Survey of Nutrition for Allied Health Professionals
DIET 5030  Sustainable Food Systems
DIET 5050  Food Processing: Farm to Institution
DIET 5060  Maternal and Child Nutrition and Health
DIET 5070  Culinary and Medicinal Herbs
DIET 5100  Human Nutrition: Physiology and Metabolism I
DIET 5130  Human Nutrition: Physiology and Metabolism II
DIET 5210  Pediatric Nutrition
DIET 5220  Gerontological Nutrition
DIET 5300  Community Nutrition
DIET 5480  Nutrition Education and Counseling
DIET 5550  Nutr. & Physical Performance
DIET 5690  Bioenergetics of Exercise
DIET 5700  Exercise Testing And Prescription
DIET 5750  Gastronomy
DIET 5870  Seminar in Dietetics Research
DIET 5980  Graduate Reading Course
MOT 5150  Kinesiology
### MOT Courses
- MOT 5250 Policy & Administration
- MOT 5300 Fundamentals of OT Practice
- MOT 5400 Occupational Therapy for Adults with Physical Dysfunction
- MOT 5410 Occupational Therapy in Mental Health
- MOT 5450 Occupational Performance & Assessment of Children and Youth
- MOT 5500 Occupational Therapy for Adults with Neurological Dysfunction
- MOT 5540 Occupational Therapy and Community Practice
- MOT 5550 Independent Study
- OCTH 5010 Foundations of Occupational Therapy: Theories, Domains and Processes
- OCTH 5011 Occupational Science in Practice and Society
- OCTH 5012 Conceptualizations and Applications of Occupational In/Justice
- OCTH 5930 Special Topics
- OCTH 5980 Independent Study in Occupational Therapy

### DPT Courses
- DPT 4021 Kinesiology I
- DPT 4122 Kinesiology II
- DPT 4146 Developmental Biology
- DPT 4226 Therapeutic Exercise
- DPT 5123 Clinical Gait
- DPT 5142 Evidence Based Practice
- DPT 5149 Applied Neuroscience
- DPT 5218 Effective Communication and Teaching
- DPT 5930 Special Topics
- DPT 6124 Biomechanical Interventions
- DPT 6178 Applied Administration and Management
- DPT 6930 Special Topics
- DPT 6980 Independent Study
- MAT 5100 Kinesiology
- MAT 5133 Lab Studies and Imaging
- MAT 5160 Bioenergetics Human Performance
- MAT 5200 Psychology of Sport and Injury
- MAT 5650 Research in Athletic Training
- MAT 6160 Enhancing Human Performance
- MIT 6100 Masters Seminar II
- PAED 5300 Evidence-Based Medicine

### OTH Courses
- CHEM 5440 Bioorganic Chemistry
- CHEM 5610 Biochemistry 1
- CHEM 5615 Biochemistry 2
- CHEM 5620 Biophysical Chemistry
- CHEM 5630 Introduction to Chemical Biology and Biotechnology
- CVNG 4190 Sustainable Land Development Engineering
- CVNG 5260 Environmental Solutions in Developing Countries
- CVNG 5450 Traffic Engineering
- CVNG 5470 Urban Transportation Planning
- MATH 5021 Introduction to Analysis
- MATH 5023 Multivariable Analysis
- MATH 5080 Probability Theory
- ORES 5010 Introduction to Biostatistics for Health Outcomes
- ORES 5150 Multivariate Analysis for Health Outcomes Research
- ORES 5300 Foundations of Outcomes Research I
- ORES 5430 Health Outcomes Measurement
- ORES 5100 Research Methods in Health & Medicine

### Total Credits
- 15-21

### Physics Concentration

**Concentration Core Department**
- PHYS 5010 Nanoscience and Nanofabrication Frontiers
- PHYS 5020 Experimental Physics
- PHYS 5030 Mathematical Methods in Physics

**Concentration Interdisciplinary Course**
Select two to three of the following:
- CHEM 5570 Group Theory & Spectroscopy
- CHEM 5800 Fundamentals and Design of Nanomaterials
- CHEM 5560 Solid State Chemistry
- ECE 5132 Analog Integrated Circuit Design
- ECE 5150 Filter Design
- ECE 5235 Digital IC Design

**Total Credits**
- 15-18

### Roadmap
Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td><strong>Year One</strong></td>
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</tr>
<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>Core Course</td>
<td>3</td>
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</table>
### Spring
- **Core Course**
  - Credits: 3
- **Summer**
  - **Core or Interdisciplinary Course**
  - Credits: 3

### Year Two
### Fall
- **Core or Interdisciplinary Course**
  - Credits: 3
### Spring
- **Core or Interdisciplinary Course**
  - Credits: 3
### Summer
- **Core or Interdisciplinary Course**
  - Credits: 3

### Year Three
### Fall
- IAS 6010 *Interdisciplinary Seminar* 1
- IAS 6030 *Interdisciplinary Research* 2
- IAS 6990 *Dissertation Research* 3
  - Credits: 6
### Spring
- IAS 6010 *Interdisciplinary Seminar* 1
- IAS 6030 *Interdisciplinary Research* 2
- IAS 6990 *Dissertation Research* 3
  - Credits: 6
### Summer
- IAS 6990 *Dissertation Research* 3
  - Credits: 3

### Year Four
### Fall
- IAS 6010 *Interdisciplinary Seminar* 1
- IAS 6030 *Interdisciplinary Research* 2
- IAS 6990 *Dissertation Research* 3
  - Credits: 6
### Spring
- IAS 6010 *Interdisciplinary Seminar* 1
- IAS 6030 *Interdisciplinary Research* 2
  - Credits: 3
  - Total Credits: 42

### Program Notes
- Core courses are defined as lecture or lab course offered in concentration home department.
- Interdisciplinary courses are defined as lecture or lab course offered outside of concentration home department.

### Contact Us
For more information about our program, please contact:

Vasit Sagan, Ph.D.
Integrated and Applied Sciences Program Director