

MATERIALS SCIENCE - PH.D.

College of Arts and Sciences
www.kent.edu/materials-science

About This Program

The Materials Science Ph.D. program offers advanced coursework and research opportunities in materials science, preparing you for a career in academia or industry. With experienced faculty and access to state-of-the-art facilities, you'll be equipped with the skills needed to make an impact in the field. Read more...

Contact Information

- Program Director: **Antal Jakli** | msgpdirector@kent.edu | 330-672-3899
- Connect with an Admissions Counselor: U.S. Student | International Student

Program Delivery

- **Location:**
 - Kent Campus
- **Delivery:**
 - In person

Examples of Possible Careers and Salaries*

Computer and information research scientists

- 15.4% much faster than the average
- 32,700 number of jobs
- \$126,830 potential earnings

Physical scientists, all other

- -3.0% decline
- 22,800 number of jobs
- \$107,210 potential earnings

Physicists

- 7.3% faster than the average
- 18,200 number of jobs
- \$129,850 potential earnings

Biochemists and biophysicists

- 4.0% about as fast as the average
- 34,600 number of jobs
- \$94,270 potential earnings

Biological scientists, all other

- 2.2% slower than the average
- 44,700 number of jobs
- \$85,290 potential earnings

Chemists

- 4.7% about as fast as the average
- 86,700 number of jobs
- \$79,300 potential earnings

Chemical engineers

- 4.4% about as fast as the average
- 32,600 number of jobs
- \$108,540 potential earnings

* Source of occupation titles and labor data comes from the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at which half of the workers in the occupation earned more than that amount and half earned less.

For more information about graduate admissions, visit the graduate admission website. For more information on international admissions, visit the international admission website.

Admission Requirements

- Bachelor's degree or higher from an accredited college or university
- Minimum 2.750 GPA on a 4.000 point scale
- Official transcript(s)
- Goal statement
- Résumé or curriculum vitae
- Two letters of recommendation
- English language proficiency - all international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning one of the following:
 - Minimum 525 TOEFL score
 - Minimum 71 TOEFL score
 - Minimum 74 MELAB score
 - Minimum 6.0 IELTS score
 - Minimum 50 PTE score
 - Minimum 100 Duolingo English score

GRE scores (general and subject test in physics or chemistry) are not required, but strongly recommended. Admission will be granted by examination of the student's background on an individual basis. Students from a variety of undergraduate majors—such as physics, chemistry, engineering and materials science—are invited to apply.

Application Deadlines

- **Fall Semester**
 - Priority deadline: January 15
Applications submitted by this deadline will receive the strongest consideration for admission.

Program Requirements

Major Requirements

Code	Title	Credit Hours
Major Requirements		
MTSC 72242	CHARACTERIZATION OF SOFT MATTER	3
MTSC 73000	PHYSICS OF SOFT MATTER	3
MTSC 73015	CHEMISTRY OF SOFT MATTER	3

MTSC 73020	APPLICATIONS OF SOFT MATTER	3
Approved Electives, choose from the following:		18-48
BSCI 70158	MOLECULAR BIOLOGY	
BSCI 70220	BIOINFORMATICS	
BSCI 71120	BIOLOGICAL LIGHT MICROSCOPY	
CHEM 70352	INORGANIC MATERIALS CHEMISTRY	
CHEM 70451	ORGANIC MATERIALS CHEMISTRY	
CHEM 70478	SYNTHESIS OF ORGANIC LIQUID CRYSTALS	
CHEM 70559	NANOMATERIALS	
CHEM 70571	SURFACE CHEMISTRY	
CHEM 70254	BIOMEMBRANES	
MTSC 72241	STATISTICAL MECHANICS OF SOFT MATTER	
MTSC 72249	LABVIEW FOR DATA ACQUISITION AND INSTRUMENT CONTROL	
MTSC 72335	ADVANCED LIQUID CRYSTALLINE AND POLYMERIC MATERIALS	
MTSC 72450	LIQUID CRYSTAL OPTICS I: THEORY	
MTSC 72452	LIQUID CRYSTAL OPTICS II: OPTICAL SYSTEMS	
MTSC 72460	LIQUID CRYSTAL MATERIALS SCIENCE	
MTSC 72462	LIQUID CRYSTAL SCIENCE: PHYSICAL PROPERTIES	
MTSC 72640	LIQUID CRYSTAL, POLYMER AND COLLOID COMPOSITES	
MTSC 72643	ELECTRO-OPTICS OF LIQUID CRYSTALS: MODELING AND DEVICE DESIGN	
MTSC 72647	STRUCTURED FLUIDS	
MTSC 72650	COMPUTATIONAL MATERIALS SCIENCE	
MTSC 72651	NANOBIOTECHNOLOGY	
MTSC 73010	LYOTROPIC LIQUID CRYSTALS	
MTSC 73025	ACTIVE MATTER	
MTSC 73100	EMERGING DISPLAY TECHNOLOGIES	
MTSC 74491	SEMINAR: LIQUID CRYSTALS	
MTSC 74495	SPECIAL TOPICS IN CHEMICAL PHYSICS	
MTSC 75006	LIQUID CRYSTAL DEVICE PROTOTYPING	
MTSC 75008	LIQUID CRYSTAL DEVICE CONSTRUCTION	
MTSC 75032	SCIENTIFIC COMMUNICATION	
MTSC 80498	RESEARCH	
PHY 76403	ADVANCED CONDENSED MATTER PHYSICS	
PHY 78401	LIQUID CRYSTAL PHYSICS	
Additional courses with advisor approval		
<i>Culminating Requirement</i>		
MTSC 80199	DISSERTATION I ¹	30
Minimum Total Credit Hours for Post-Baccalaureate Students		90
Minimum Total Credit Hours for Post-Master's Students		60

¹ Each doctoral candidate, upon admission to candidacy, must register for MTSC 80199 for a total of 30 credit hours. It is expected that a doctoral candidate will continuously register for Dissertation I, and thereafter MTSC 80299, each semester, until all requirements for the degree have been met. A prospectus of the dissertation research project is required for all Ph.D. candidates. The prospectus is prepared jointly with the student's dissertation advisor. The prospectus must be approved by the members of the student's dissertation committee. A dissertation presenting and interpreting results of original research is required for the Ph.D. degree. Following acceptance of the dissertation by the dissertation committee, the final degree requirement is the satisfactory completion of the final oral exam (defense of dissertation) in front of a committee of graduate materials science faculty and

representatives from other departments in the College of Arts and Sciences.

Graduation Requirements

Candidacy Requirement

In addition to satisfying the course work, students must pass the materials science candidacy examination. The examination is divided into two parts, a written exam and an oral exam.

The written exam is scheduled first, followed by the oral exam. The exams will cover the core courses of the materials science program taken during the first year. Students who do not pass the candidacy exam the first time may take it a second time. The first attempt at candidacy usually will take place in August, during the week before the start of the fall semester of the student's second year of study. The second attempt usually will take place in January, during the week before the start of the spring semester of the student's second year of study. A request for exception will be considered for medical reasons or for other unpredictable circumstances. Requests must be submitted in writing with supporting documentation prior to the test date and must be approved by the candidacy exam committee and by the director of the materials science program.

Students who fail the second attempt cannot continue towards the doctoral degree, but may complete the requirements for the Master of Science degree.

Program Learning Outcomes

Graduates of this program will be able to:

1. Develop an advanced understanding of the fundamental science of liquid crystals and related advanced materials and ability to apply acquired knowledge of physical and chemical properties of soft materials and devices such as liquid crystals, polymers, colloids and active matter.
2. Gain experience in presenting scientific data in research publications, articles, posters and oral presentations.
3. Apply acquired knowledge to the discovery of new advanced materials and development of advanced materials-based devices and applications.

Full Description

The Ph.D. degree in Materials Science provides students with extensive scientific training, cutting-edge research opportunities and engineering skills necessary for a variety of careers in academy and industry. Program faculty and students conduct research through Kent State's participating departments and the Advanced Materials and Liquid Crystal Institute. Such research includes liquid crystal synthesis and molecular design; properties of liquid crystals and related advanced materials; lyotropic liquid crystals and bio-related materials, opto-electronics; and nanoscience and nanotechnologies. These important research foci are inherently interdisciplinary.