

Kent State University
Materials Science Graduate Program
Student Handbook

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1. Introduction

Previously known as Chemical Physics Interdisciplinary Program, the Materials Science Graduate Program (MSP) at Kent State University offers a unique education focusing on physics and chemistry of soft condensed matter. Leading to Master of Science and/or Doctor of Philosophy degrees. The program emphasizes both fundamental and applied interdisciplinary training at the interface between soft matters and advanced bio-, nano- and mesostructured materials.

The graduate program offers students the opportunity to conduct research under the guidance of members of the Advanced Materials and Liquid Crystal Institute (AMLCI) of Kent State University. Previously, known as the Liquid Crystal Institute (LCI), founded in 1965 by Glenn H. Brown, the Institute was the world's first research center specializing in the basic and applied science of liquid crystals. One goal of such research is to discover novel liquid crystal materials and develop techniques to control their phase behavior, microstructure and electro-optic response, for instance to advance the state-of-the-art in information display. New and emerging application areas include advanced photonics, sensors, biomaterials, bio- and medical applications, and smart/responsive materials.

The Materials Science Graduate Program is designed for students from a broad range of undergraduate majors including physics, chemistry (synthetic and physical), materials science, chemical engineering, polymer engineering, and biology. The curriculum includes courses ranging from theory and modeling of liquid crystals to experimental physics, materials synthesis and characterization, to nano- and biomaterial applications of soft condensed matter. An important aspect of the curriculum is flexibility in course work and evolving course content that keeps pace with new research challenges and societal needs. Core courses are accessible to a multidisciplinary audience, at the graduate level, and will prepare students to pursue research in soft matter and other closely related disciplines.

Materials Science alumni from the last twenty-five years have undertaken exciting careers in industrial research and development, in national labs, and in academia.

3. Programs Learning Outcomes

Graduates of this program will be able to:

1. Gain an advanced understanding of the fundamental science of Soft Matter and Advanced Materials and Liquid Crystals, and the ability to apply acquired knowledge of physical and chemical properties of soft materials to understand utilize novel phenomena at the interface with liquid crystals.
2. Gain experience in presenting scientific data in research publications, posters and oral presentations.

3. Learn to apply acquired knowledge to device development based on new advanced materials at the interface of liquid crystals.

4. Graduate Program Contact Information

For more information, or if you would like to arrange a visit to the Advanced Materials and Liquid Crystal Institute, please contact the Director of Materials Science Graduate Program.

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Professor of Physics

Director of Materials Science Graduate Program

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5. Application Procedure

The [Kent State Division of Graduate Studies](#) oversees admissions for all graduate programs.

- Applicants who are US citizens or permanent residents should use the application link [here](#) to apply for admission to our Materials Science Graduate Program.
- International applicants should use the international application link [here](#) to apply for admission to our Materials Science Graduate Program.

If you have questions about how to complete the application, you can request assistance via email to gradapps@kent.edu. [The Office of Global Education](#) can provide assistance to international applicants and can be reached via email at intladm@kent.edu.

New students should apply for fall semester admission, since the Materials Science Graduate Program starts only in the fall semester of each academic year.

5.1 Application Deadline

The application deadline for initial fall semester enrollment is January 31st for the Ph.D. and April 15th for Master of Science Degree tracks. The admissions committee begins reviewing completed applications in February. Applications that arrive before the deadline will receive full consideration for admission and financial support. The application process remains formally open until the incoming class is full; applications arriving after the deadline will be considered on a case-by-case basis.

5.2 Application Requirement

For full consideration, an applicant is required to submit the following documents.

- (1) A completed graduate application for admission (using the links above.)
- (2) Official transcripts of academic work and degree certificates from each college or university attended.
- (3) Minimum GPA 3.0 on a point scale of 4.0.
- (4) A goal/purpose statement.
- (5) Two letters of recommendation.
- (6) International applicants whose education has been primarily outside the United States must provide evidence of proficiency in the English language. Exceptions are described [here](#).

Kent State accepts several different English Language Proficiency tests. The required scores for admission are the following:

- Internet based Test of English as a Foreign Language (TOEFL): 71
- Paper based TOEFL: 525
- Michigan English Language Assessment Battery (MELAB): 74
- International English Language Testing System (IELTS): 6.0

Results that are more than 2 years old are not acceptable.

- (7) Graduate Record Examination (GRE) and subject based GRE (in Physics or Chemistry) are not required but are strongly recommended.
- (8) Application fee.

Submission of all materials by the application deadline is strongly encouraged. The sooner a file is completed, the sooner a formal decision can be made.

Applicants may upload 'unofficial' copies of their GRE and TOEFL test scores through the online application system. These will be used for internal departmental evaluation for admission. However, the Graduate Studies office requires that 'official' TOEFL results reach us from the testing agency before any admission offer can be extended.

Kent State's institution code for reporting GRE and TOEFL scores is 1367.

6. Admission Process

When the online application is complete, the applicant will receive notification via e-mail. Applicants can view the status of their submitted application using the Login ID and PIN

they created. The office of Graduate Studies will send applicants e-mail regarding any incomplete application materials.

Only completed applications and materials are forwarded to the Material Science Graduate Program for review. The program admission committee then forwards its recommendation to the academic college dean. The dean's decision is sent to the Office of Graduate Studies. The Dean of Graduate Studies sends the official admission decision letter to the applicant.

When an international student is accepted for admission, Kent State's Office of Global Education will issue the I-20 or DS-2019. Newly admitted international students can find [useful information](#) and instructions about applying for a US visa.

6.1 Admission Decision Timeline

Offers of admission are sent beginning in mid-February. Additional offers may be sent later, if space is available, until the incoming class is full. Rejection notices are usually sent in June.

If you receive a rejection the first time you apply, you may reapply for the following term. However, a new application with application fees is required. Your file and all submitted materials will be kept for one year. Contact the graduate admissions/international admissions via email to obtain guidelines on how to update your file. Documents submitted to the Materials Science Graduate Program are not returned.

7. Financial Support

Generally, all students accepted to the Ph.D. program receive an offer of financial support in the form of a graduate assistantship. In recent years, this support includes a monthly stipend of around \$2,100 and a full tuition waiver. Students receiving financial support must meet the obligations listed below:

1. Attend Graduate Student Orientation the week prior to the beginning of the fall semester.
2. Maintain full-time student status (registered for at least eight credit hours of graduate level courses) with at least a 3.00 GPA.
3. Do not accept any other employment on campus without prior approval from the Division of Graduate Studies.
4. Graduate assistants are assigned to either teaching or research duties each semester.
 - a. Teaching assistants must commit 20 hours of teaching-related service per week for a total of 300 hours per semester.

- b. Research assistants must commit 20 hours of research-related service per week for a total of 300 hours per semester.

In addition to the stipend and tuition waiver, graduate assistant students may receive (not guaranteed) a partial health insurance credit (covering approximately 70% of the cost) to be applied toward the health insurance plan for graduate assistant students offered through Kent State University.

8. Taxes on Stipend

Graduate student stipends are subject to local, state, and federal income tax. According to current US law, the tuition waiver is not considered taxable income. Some foreign countries have negotiated tax-treaties with the U.S; students coming from those countries may be subject to different tax regulations. To learn more about taxes and how to submit tax returns, consult the US Internal Revenue Service.

9. Course and Credit Information and Requirements

Our core courses requirement for Ph.D. are:

Physics of Soft Matter: This course is designed to teach the basics of physics of soft matter that includes polymers, liquid crystals, colloids, reduced dimensionality fluids and active matter. It will give the students a coherent and deep understanding of the most important concepts and scientific results of soft matter, such as nano-, and microscopic structures, mechanical, electrical and optical properties.

Chemistry of Soft Matter: This course will familiarize the students with the basic underlying chemical concepts in soft matter science. The course will familiarize students with the key scientific concepts in soft matter physics and chemistry focusing on the most important chemical building blocks in soft matter, IUPAC rules of naming them, miscibility rules and micro-segregation of chemically incompatible molecular segments, physical and electronic properties of aromatic compounds including heterocyclic and fluorinated aromatics, properties of aliphatic and perfluorinated hydrocarbons, unsaturation, structure-property relationships and all levels of chirality (molecular to supramolecular).

Characterization of Soft Matter: The advancement in basic Soft Matter research is generally driven by the experimental techniques available and the interdisciplinary knowledge among condensed matter physicists, biologists, synthetic and physical chemists, as well as chemical and polymer engineers. This course will provide students with the fundamentals of the most commonly used techniques for the study and understanding of soft matter at the macroscopic and microscopic level, specially at the

nanometer scale. The course outline is intended to be accessible to a multidisciplinary audience (at the graduate student level) that will pursue soft matter research and research on other closely related disciplines.

Applications of Soft Matter: This course is designed for students to receive a basic overview of applications of soft matter ranging from device manufacturing to polymers and biomaterials for biological /biomedical applications

9.1 M.S. degree in Materials Science

The M.S. degree in materials science requires the completion of 30 credit hours. Candidates may choose to do a master's thesis by registering for "Research for credit" for a total of 6 credit hours. The thesis for the Master of Science degree will present and interpret results of original research and are required for defense before a committee selected within the members of the Advanced Materials and Liquid Crystal Institute that are Materials Science graduate faculty.

9.2 Ph.D. degree in Materials Science

Post-baccalaureate students are required to complete a minimum of 90 credit hours - 12 credit hours of core courses, 48 credit hours of elective courses including a maximum of 15 credit hours of research, and 30 credit hours of dissertation.

Post-master's students are required to complete a minimum of 60 credit hours beyond the master's degree - 12 credit hours of core courses, minimum of 18 credit hours of elective courses including maximum of 10 credit hours of research, and 30 credit hours of dissertation. The student's faculty advisor must approve the choice of electives. If a required core course is not available, an equivalent course may be a substitute with permission of the director of Materials Science Graduate Program.

** Students who were admitted to the Materials Science Graduate Program before August 2020 and plan on graduating after the start of Fall 2020, can choose to receive a MS or PhD in Materials Science or Chemical Physics.*

9.3 Candidacy exam

In addition to satisfying the course work, the student must pass the Materials Science candidacy examination. The purpose of the candidacy exam is to attest that a graduate student will be capable to do research and write dissertation and publications needed for PhD Degree. For that the PhD Candidates should demonstrate that they have sufficient knowledge and understanding of the core areas of the graduate program, can critically think to analyze data, and able to design and carry out research. In order to take the

Candidacy exam, students are required to take and pass the four core courses with a minimum grade of C.

The exam has two parts:

The first portion covers the four core courses of the graduate program: Physics of Soft Matter, Chemistry of Soft Matter, Applications of Soft Matter, and Characterization of Soft Matter. This will be tested in form of a 2-hours open book written exam (lecture notes and previous assignments can be used) scheduled for the week before the fall semester. The exam will test that the student can critically think and can apply their knowledge to analyze data and interpret them properly.

The second part is a Research Proposal (RP)* that must be written and submitted by July 15th. The RP describes a short term (3-4 month long) research that can be either hypothetical or based on an actual summer or one semester research. The RP will be prepared by the students in consultation with a faculty member chosen by the students. Two weeks after the students submit their research proposals, they will receive written feedback from their Candidacy Exam Committee (CEC). The CEC will consist of the consulting faculty member chosen by the student and 3 other members selected by the Graduate Program Committee (GPC) based on the student's background and research topic.

If required by the CEC, the student should revise the RP by the middle of August. If the RP is deemed defensible, before the last week of the Summer session, the student can schedule the oral defense with the CEC, preferably for the last week before the fall semester. If the student fails the second submission and is not deemed to be defensible by more than one member of the CEC, then the oral examination will be scheduled upon approval by the CEC, but not earlier than one week after approval.

Format of the RP:

The written RP should be up to five single-spaced pages (font size:12, margins: 1"), not including the numbered references. The RP consists of a Cover Page, the Project Description and references cited. The cover page contains the title, student and faculty advisor name, research period and an up to 500 words Abstract. The up to 4-page Project Description should describe the research idea and approach, the research plan with milestones and methods, the expected results and future directions. Each numbered reference contains the name of authors, title of paper, journal name, volume, pages and year, or Title of book, Authors (editor), publisher, pages and year.

The oral defense will begin with a 15-20 minutes presentation of the proposed research. Questioning will then be conducted by the CEC. The proposed research (and actual results for research completed) will be the major focus for inquiry, but questions can also involve other areas related to the proposed research. A successful defense will demonstrate that the student mastered the contents of the core courses, understood and can communicate the knowledge that a short-term research project requires. The student passes the oral examination if there is no more than one negative vote by the CEC.

Students are expected to take each exam on schedule. Under extraordinary circumstances, a student may request to be excused from an exam. Requests must be submitted in writing with supporting documentation prior to the test date and must be approved by the CEC and the director of the Graduate Program. Unexcused absence from the exam will result in a failing grade.

Students who fail any elements of the candidacy exam for the first time, will have a chance to repeat that portion of the exam in January during the week before the spring semester starts. Successful passing of all elements of the candidacy exam will give the student the green light to proceed with PhD program. Students who fail any elements of the exam twice, cannot proceed with PhD Program, but can complete the requirements for the Materials Science Master's Degree with or without Thesis.

9.4 Dissertation

Each doctoral candidate, once candidacy evaluation has been successfully completed, must register for "Dissertation I" for two semesters then continue at "Dissertation II" level each semester, including one term each summer, until all requirements for the degree have been met. Dissertation I and II correspond to 30 credit hours.

A prospectus of the dissertation research project is required for all Ph.D. candidates, due before the start of the semester they plan to defend in. The prospectus is prepared in consultation 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 Materials Science faculty and representatives from other departments in the College of Arts and Sciences.

10. Timetable

Typical times require to get the degrees are given in the chart.

| Degree | Time Required |
|----------------------------------|---------------|
| M.S. | 9-21 months |
| M.S. with thesis | 11-21 months |
| Ph.D. with prior master's degree | 3.5-5 years |
| Ph.D. | 4.5-6 years |

11. Academic Advisors

Every student joining the program will be advised by a curriculum advisor. Curriculum advisors help students to select appropriate courses and follow up on student progress in course work and teaching assistantship. If a student fails to fulfill the obligations of the graduate school and the program requirements, the curriculum advisor will inform the director of the program.

When the PhD student enters Dissertation I he/she will be advised by the dissertation advisor (DA). DA defines the subject and plan the research project that will lead to a dissertation and defense with graduation. DAs help students with their career development by guiding on different career paths, providing information to present their work on different scientific conference and ensuring the environment that will allow the student to complete their degree within the usual timeframe.

12. Student Academic Complaint Committee (SACC)

The purpose of this committee is to provide an appropriate framework and method to resolve student complaints of an academic nature. As such, this policy is specifically designed to maintain the integrity of the academic environment and to ensure that the rights of students in such matters are clearly stated and protected. The SACC will consist of 3 faculty members, with the addition of at least one student voted by the students of the Materials Science Graduate Program. The policies and procedures of this committee are governed by University Policy 3342-4-02.3.

13. Information for New Students

Before the beginning of the fall semester, graduate students of the program are required to attend graduate student orientation (GSO). GSO will provide the opportunity to learn about university resources and network with other graduate students, along with representatives of KSU's faculty, staff, and administration. Information about the GSO can be found on the website at: [<https://www.kent.edu/graduatestudies/event/graduate-student-orientation-all-new-graduate-students-3>]

Materials Science Graduate Program will also hold a fall semester graduate student orientation that you will also need to attend.

14. Information for International Students

Before the beginning of the fall semester, international graduate students of the program are required to attend graduate student orientation (GSO). GSO will provide the opportunity to learn about university resources and network with other graduate students, along with representatives of KSU's faculty, staff, and administration. Information about the GSO can be found on the website at:

[<https://www.kent.edu/globaleducation/orientation>]

Materials Science Graduate Program will also hold a fall semester graduate student orientation that you will need to attend.

List of potentially useful websites:

- Online Orientation [<https://www.kent.edu/globaleducation/online-international-student-orientation>]
- Office of Global Education: [<https://www.kent.edu/iss>]
- Information of newly admitted International students:
[<https://www.kent.edu/graduatestudies/event/graduate-student-orientation-all-new-graduate-students-3>]
- Orientation [<https://www.kent.edu/globaleducation/orientation>]
- Airport/Arrivals [<https://www.kent.edu/globaleducation/airportsarrivals>]
- Housing [<https://www.kent.edu/globaleducation/housing>]
- To Do When You Arrive in Kent [<https://www.kent.edu/globaleducation/do-when-you-arrive-kent>]
- Contact Information of International Admission Council
[<https://www.kent.edu/globaleducation/contact-international-admissions-counselor>]

15. Helpful Links to the Advanced Materials and Liquid Crystal Institute:

AMLCI research facilities [<https://www.kent.edu/amlci/amlci-research-facilities>]

- Research Area [<https://www.lcinet.kent.edu/research/index.php>]
- Student Organizations [https://www.lcinet.kent.edu/student_org/index.php]
- Faculty Member List
[<https://www.kent.edu/materials-science/faculty>]

- Research and Technical Staff
[https://www.lcinet.kent.edu/members/res_tech_staff.php]
- Graduate Students
[<https://www.lcinet.kent.edu/members/index.php?category=students>]
- Visiting Scientists
[<https://www.lcinet.kent.edu/members/index.php?category=visitors>]
- Honorary Members of the AMLCI
[<https://www.lcinet.kent.edu/members/honorary.php>]
- Seminars Information [<https://www.lcinet.kent.edu/seminar/public/calendar.php>]
- News and Announcements [<https://www.kent.edu/materials-science/news-announcements>]