

# KENT STATE UNIVERSITY

## CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date **29-Oct-19**

Curriculum Bulletin \_\_\_\_\_

Effective Date **Fall 2020**

Approved by EPC \_\_\_\_\_

Department

College **AS - Arts and Sciences**Degree **PHD - Doctor of Philosophy**Program Name **Chemical Physics Interdisciplinary Program** Program Banner Code **CPHY**

Concentration(s) Concentration(s) Banner Code(s)

Proposal **Revise program**

Description of proposal:

**CPIP is revising the name of the program from Chemical Physics (CPHY) to Materials Science (MTSC).**

*Increase research options for post-master's students*

Does proposed revision change program's total credit hours? ☐ Yes ☒ No *(9 credits)*

Current total credit hours: Proposed total credit hours

Describe impact on other programs, policies or procedures (e.g., duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

**No impact on other programs, policies or procedures.**

Units consulted (other departments, programs or campuses affected by this proposal):

**BSCI, CHEM, PHY**

### REQUIRED ENDORSEMENTS

*Arifal Jabeel* 10/29/2019  
Department Chair / School Director

\_\_\_\_\_ \_\_\_\_/\_\_\_\_/\_\_\_\_  
Campus Dean (for Regional Campuses proposals)

*Mary Ann Haley* 12/13/19  
College Dean (or designee)

*Cynthia R. Stellingma* 1/10/20  
Dean of Graduate Studies (for graduate proposals)

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Provost (or designee)

*CPHY*  
*62*



**Department of  
Higher Education**

**Mike DeWine**, Governor  
**Randy Gardner**, Chancellor

## CHANGE REQUEST: TITLE AND CURRICULUM MODIFICATION

**Date of submission:** *to come after Board of Trustees approval*

**Name of institution:** Kent State University

**Previously approved title:** M.S. and Ph.D. degrees in Chemical Physics

**Proposed new title:** M.S. and Ph.D. degrees in Materials Science

**Proposed implementation date of the request:** Fall 2020 Semester

**Date that the request received final approval from the appropriate institutional committee:**  
Kent State University Board of Trustees approved the revisions on *date to come*

### Primary institutional contact for the request

**Name:** Cindy Stillings  
**Title:** Dean of Graduate Studies (Interim)  
**Phone:** 330-672-0119  
**E-mail:** cstillin@kent.edu

### Educator Preparation Programs:

Leads to licensure: ☐ Yes ☒ No  
Leads to endorsement: ☐ Yes ☒ No

### Explain the rationale for title and curricular changes.

Chemical Physics is an interdisciplinary program at Kent State University, established in 1964 and built upon the research experience from the foundational departments of physics, biological sciences, mathematical sciences and chemistry and biochemistry, in addition to the research conducted in Kent State's Advanced Materials and Liquid Crystal Institute.

The Ph.D. degree in Chemical Physics underwent a substantial curricular revision in fall 2019 (approved by Chancellor's Council on Graduate Studies on May 17, 2019) to focus on materials science with emphasis on soft-, nano- and bio-materials. The proposed revisions for the M.S. degree now align with the Ph.D. degree. Minor curricular changes are proposed for the Ph.D. degree. Titles are revised for both degree programs to reflect the new focus.

**Is the Classification of Instructional Programs (CIP) code changing? If yes, explain why.**

The CIP code will change, see below, to reflect the education of soft matter scientists, rather than chemical physicists. The main research areas of students in the program are in soft materials (liquid crystals, polymers, elastomers, colloids and their compositions. Students work researchers from Kent State's Advanced Materials and Liquid Crystal Institute and publish in such journals as *Advanced Materials*, *Nature Materials*, *Materials Horizons*, *Soft Matter* and *Liquid Crystals Today*.

Current CIP	New CIP
<b>40.0508 Chemical Physics.</b> A program that focuses on the scientific study of structural phenomena combining the disciplines of physical chemistry and atomic/molecular physics. Includes instruction in heterogeneous structures, alignment and surface phenomena, quantum theory, mathematical physics, statistical and classical mechanics, chemical kinetics, and laser physics.	<b>40.1001 Materials Science.</b> A program that focuses on the general application of mathematical and scientific principles to the analysis and evaluation of the characteristics and behavior of solids, including internal structure, chemical properties, transport and energy flow properties, thermodynamics of solids, stress and failure factors, chemical transformation states and processes, compound materials, and research on industrial applications of specific materials.

**Describe how the title and curricular changes will affect students in the current program.**

Currently enrolled students in the M.S. degree may choose to pursue the new curriculum, and students in the M.S. and Ph.D. degrees may opt to update their catalog and graduate under the revised name but are not required to do so.

**Describe any faculty, administrative or support service changes occurring along with the title and curriculum changes.**

The college has no expectations of immediate changes in resources to support the program.

**Provide evidence that the appropriate accreditation agencies been informed of the proposed change (if applicable).**

Not applicable. The program does not have specialized or professional accreditation.

**Describe how the effectiveness of the new curriculum will be monitored over time.**

The effectiveness of the new curriculum will be evaluated by monitoring the number and quality of applicants, the average time students take to complete the program, the percentage of the graduating students and the percentage of job placements after graduation. This evaluation will be reviewed five years after implementation of these proposed revisions.

**Submit a comparison of the currently authorized curriculum and the proposed curriculum.**

See tables at the end of the document for a comparison of the current and proposed curriculum.

Below is a summary of changes for the M.S. degree:

- Required courses in the major are replaced and decreased:

<b>Current Requirements (15 credit hours)</b>	<b>New Requirements (12 credit hours)</b>
Liquid Crystal Optics I: Theory	Characterization of Soft Matter
Liquid Crystal Optics II: Optical Systems	Physics of Soft Matter
Liquid Crystal Materials Science	Chemistry of Soft Matter
Liquid Crystal Science: Physical Properties	Applications of Soft Matter
Seminar: Liquid Crystals	
- Optional concentration in liquid crystal engineering is eliminated.
- A culminating requirement is now clearly identified as either thesis or project.
- Electives are increased, from 3-4 to 12 credit hours.
- Two elective courses are established, two elective courses are revised and seven courses required in the Liquid Crystal Engineering concentration are inactivated.
- Total number of credit hours for program completion is unchanged at 30. Students selecting the now-eliminated Liquid Crystal Engineering concentration were required to complete 38 credit hours.
- Time to complete program is unchanged at two years.

Below is a summary of changes for the Ph.D. degree:

- Maximum amount of research courses applied to electives in the degree for post-master's students is increased, from 6 to 9 credit hours.
- Elective options are extended to related disciplines biology, chemistry and physics.
- Total number of credit hours for program completion is unchanged at 60 for post-master's students and 90 for post-baccalaureate students.
- Time to complete program is unchanged. Per Kent State University policy, doctoral students have 10 years from first enrollment to complete their degree.

In addition to the changes listed above, the course subject Chemical Physics (CPHY) is revised to Material Science (MTSC) to align with the major name change.

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The person listed below verifies that this request has received the necessary institutional approvals and that the above information is truthful and accurate.

Cynthia R. Stillings  
Dean of Graduate Studies (Interim)  
Kent State University

## Comparison of Currently Authorized Curriculum and Proposed Curriculum

[Chemical Physics](#) course descriptions (course subject will be renamed Materials Science)

M.S. Currently Authorized Curriculum		Credits
<b>Major Requirements (15-16 credit hours)</b>		
CPHY 62450	Liquid Crystal Optics I: Theory	2
CPHY 62452	Liquid Crystal Optics II: Optical Systems	2
CPHY 62460	Liquid Crystal Materials Science	2
CPHY 62462	Liquid Crystal Science: Physical Properties	3
CPHY 64491	Seminar: Liquid Crystals ( <i>repeated; 4 credits for concentration</i> )	3-4
<b>Approved Elective (3 credit hours)</b>		
Approved Elective ( <i>may include research and thesis</i> )		3
<b>Additional Requirements or Liquid Crystal Engineering Concentration (14-23)</b>		
Choose from the following:		14-23
<b>Additional Requirements (14 credit hours)</b>		
CPHY 62241	Soft Matter (2) <i>revised</i>	
CPHY 62335	Advanced Liquid Crystalline and Polymeric Materials (4)	
Approved Elective (1)		
Liquid Crystal Engineering Electives ( <i>choose from the concentration courses</i> ) (6)		
<b>Liquid Crystal Engineering Concentration (23 credit hours)</b>		
CPHY 62454	Liquid Crystal Optics III: Applications (1) <i>inactivated</i>	
CPHY 65002	Liquid Crystal Device Engineering I (2) <i>inactivated</i>	
CPHY 65004	Liquid Crystal Device Engineering II (3) <i>inactivated</i>	
CPHY 65006	Liquid Crystal Device Prototyping (2)	
CPHY 65008	Liquid Crystal Device Construction (1)	
CPHY 65010	Liquid Crystal Characterization (2) <i>inactivated</i>	
CPHY 65012	Liquid Crystal Device Testing (2) <i>inactivated</i>	
CPHY 65020	Liquid Crystal Analog Electronics (2) <i>inactivated</i>	
CPHY 65022	Liquid Crystal Digital Electronics (2) <i>inactivated</i>	
CPHY 65098	Master's Project: Engineering Applications of Liquid Crystals (6)	
Minimum Total Credit Hours:		30-38

M.S. Proposed Curriculum		Credits
<b>Major Requirements (12 credit hours)</b>		
MTSC 62242	Characterization of Soft Matter	3
MTSC 63000	Physics of Soft Matter	3
MTSC 63015	Chemistry of Soft Matter	3
MTSC 63020	Applications of Soft Matter	3
<b>Culminating Requirement (6 credit hours)</b>		
Choose from the following:		6
MTSC 60199 Thesis I (6)		
MTSC 65098 Master's Project: Engineering Applications of Liquid Crystals (6)		
<b>Approved Electives (12 credit hours)</b>		
Choose from the following:		12
BSCI 50158	Molecular Biology (3)	
BSCI 50220	Bioinformatics (3)	
BSCI 51120	Biological Light Microscopy (3)	

*Electives continued*

CHEM 50352 Inorganic Materials Chemistry (3)  
 CHEM 50451 Organic Materials Chemistry (3)  
 CHEM 50478 Synthesis of Organic Liquid Crystals (3)  
 CHEM 50559 Nanomaterials (3)  
 CHEM 50571 Surface Chemistry (2)  
 CHEM 60254 Biomembranes (2)  
 CHEM 62691 Seminar: Recent Developments in Industrial Chemistry (1)  
 MTSC 60498 Research (1-15)  
 MTSC 62241 Statistical Mechanics of Soft Matter (3) *revised*  
 MTSC 62249 LabVIEW for Data Acquisition and Instrument Control (1)  
 MTSC 62335 Advanced Liquid Crystalline and Polymeric Materials (4)  
 MTSC 62450 Liquid Crystal Optics I: Theory (2)  
 MTSC 62452 Liquid Crystal Optics II: Optical Systems (2)  
 MTSC 62460 Liquid Crystal Materials Science (2)  
 MTSC 62462 Liquid Crystal Science: Physical Properties (3)  
 MTSC 62640 Liquid Crystal, Polymer and Colloid Composites (4)  
 MTSC 62643 Electro-optics of Liquid Crystals: Modeling and Device Design (3) *revised*  
 MTSC 62647 Structured Fluids (3)  
 MTSC 62650 Computational Materials Science (3)  
 MTSC 62651 Nanobiotechnology (3)  
 MTSC 63010 Lyotropic Liquid Crystals (3)  
 MTSC 63025 Active Matter (2) *new*  
 MTSC 63100 Emerging Display Technologies (2) *new*  
 MTSC 64491 Seminar: Liquid Crystals (1)  
 MTSC 64495 Special Topics in Chemical Physics (1-3)  
 MTSC 65006 Liquid Crystal Device Prototyping (2)  
 MTSC 65008 Liquid Crystal Device Construction (1)  
 MTSC 65032 Scientific Communication (1)  
 PHY 66403 Advanced Condensed Matter Physics (3)  
 PHY 68401 Liquid Crystal Physics (3)

*Additional courses with advisor approval***Minimum Total Credit Hours: 30**

**Ph.D. Proposed Curriculum (*changes are marked*)** **Credits****Major Requirements (42 credit hours)**

CPHY 72242	Characterization of Soft Matter	3
CPHY 73000	Physics of Soft Matter	3
CPHY 73015	Chemistry of Soft Matter	3
CPHY 73020	Applications of Soft Matter	3
CPHY 80199	Dissertation I <sup>1</sup>	30

**Approved Electives (18-48 credit hours)**

*Choose from the following:* 18-48

BSCI 70158	Molecular Biology (3)	<i>added</i>
BSCI 70220	Bioinformatics (3)	<i>added</i>
BSCI 71120	Biological Light Microscopy (3)	<i>added</i>
CHEM 70352	Inorganic Materials Chemistry (3)	<i>added</i>
CHEM 70451	Organic Materials Chemistry (3)	<i>added</i>
CHEM 70478	Synthesis of Organic Liquid Crystals (3)	<i>added</i>
CHEM 70559	Nanomaterials (3)	<i>added</i>
CHEM 70571	Surface Chemistry (2)	<i>added</i>
CHEM 70254	Biomembranes (2)	<i>added</i>
MTSC 72241	Statistical Mechanics of Soft Matter (3)	<i>revised</i>
MTSC 72249	LabVIEW for Data Acquisition and Instrument Control (1)	
MTSC 72335	Advanced Liquid Crystalline and Polymeric Materials (4)	
MTSC 72450	Liquid Crystal Optics I: Theory (2)	
MTSC 72452	Liquid Crystal Optics II: Optical Systems (2)	
MTSC 72460	Liquid Crystal Materials Science (2)	
MTSC 72462	Liquid Crystal Science: Physical Properties (3)	
MTSC 72640	Liquid Crystal, Polymer and Colloid Composites (4)	
MTSC 72643	Electro-optics of Liquid Crystals: Modeling and Device Design (3)	<i>revised</i>
MTSC 72647	Structured Fluids (3)	
MTSC 72650	Computational Materials Science (3)	
MTSC 72651	Nanobiotechnology (3)	
MTSC 73010	Lyotropic Liquid Crystals (3)	
MTSC 73025	Active Matter (2)	<i>new</i>
MTSC 73100	Emerging Display Technologies (2)	<i>new</i>
MTSC 74491	Seminar: Liquid Crystals (1)	
MTSC 74495	Special Topics in Chemical Physics (1-3)	
MTSC 75006	Liquid Crystal Device Prototyping (2)	
MTSC 75008	Liquid Crystal Device Construction (1)	
MTSC 75032	Scientific Communication (1)	
MTSC 80498	Research (1-15) *	
PHY 76403	Advanced Condensed Matter Physics (3)	<i>added</i>
PHY 78401	Liquid Crystal Physics (3)	<i>added</i>

*Additional courses with advisor approval*

**Minimum Total Credit Hours for Post-Baccalaureate Students: 90**

**Minimum Total Credit Hours for Post-Master's Students: 60**

\* Post-baccalaureate students may take a maximum 15 credit hours of research. Post-master's students may take a maximum 9 ~~6~~ credit hours of research. *research limit revised*