## KENT STATE UNIVERSITY CERTIFICATION OF CURRICULUM PROPOSAL

	Prepara	tion Dat	e 29-Oct-19	Curriculum Bulletin
	Effective	e Date	Fall 2020	Approved by EPC
Dopartmont				
College	AS - Arts and Sciences			
Degree	MS - Maeter of Sci	vience		
Brogram Nama	Chamical Dhysics Interdis		n Program	Drogram Bannar Coda COUV
	Concentration(a)			riogram Danner Code CFIII
Proposal	Bowice program	Dannei	Code(s)	
Floposal	nevise program			
Description of propo CPIP is revising the (MTSC), as well as and removing the M	sal: e name of the program from revising the curriculum to //S of Liquid Crystal Engine	n Chem be simi eering.	ical Physics (C lar to the alread	PHY) to Materials Science dy approved PhD curriculum,
Does proposed revis Current total credit h	sion change program's total c ours: <b>30-38</b> Propose	redit ho d total c	urs? 🛛 Yes redit hours <b>30</b>	□ No
Describe impact on a staffing consideratio <b>No impact on other</b>	other programs, policies or p ns; need; audience; prerequi • <b>programs, policies or pro</b>	rocedure sites; te <b>cedures</b>	es (e.g., duplicat acher education	tion issues; enrollment and licensure):
Units consulted (othe BSCI, CHEM, PHY	er departments, programs or	campus	ses affected by t	his proposal):
	REQUI	RED EN	DORSEMENTS	5
A	al fall.			10,29,2019
Department Chair / S	School Director			
	•			/
Campus Dean (for F	legional Campuses proposal	s)		
Mary Ch	a Holey			12/13/19
College Dean (or de	signee)			
Cepthica	Allellug			1,10,20
Dean of Graduate S	tudies (for graduate proposa	is)		
-				//
Provost (or designee	e)			



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:	$\Box$ 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
40.0508 Chemical Physics. A program that	40.1001 Materials Science. A program that
focuses on the scientific study of structural	focuses on the general application of
phenomena combining the disciplines of	mathematical and scientific principles to the
physical chemistry and atomic/molecular	analysis and evaluation of the characteristics
physics. Includes instruction in heterogeneous	and behavior of solids, including internal
structures, alignment and surface phenomena,	structure, chemical properties, transport and
quantum theory, mathematical physics,	energy flow properties, thermodynamics of
statistical and classical mechanics, chemical	solids, stress and failure factors, chemical
kinetics, and laser physics.	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:

Current Requirements (15 credit hours)	New Requirements (12 credit hours)
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 postmaster'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 postmaster'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.

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 Kent State University | Name and Curriculum Change Request | M.S. and Ph.D. Chemical Physics | Page 4

### Comparison of Currently Authorized Curriculum and Proposed Curriculum

<u>Chemical Physics</u> course descriptions (course subject will be renamed Materials Science)

M.S. Current	tly Authorized Curriculum	Credits
Major Require	ments (15-16 credit hours)	
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 (repeated; 4 credits for concentration)	3-4
Approved Elec	tive (3 credit hours)	
Approved Elect	tive (may include research and thesis)	3
Additional Rec	uirements or Liquid Crystal Engineering Concentration (14-23)	
Choose from th	e following:	14-23
Additional R	Requirements (14 credit hours)	
CPHY 62241	Soft Matter (2) revised	
CPHY 62335	Advanced Liquid Crystalline and Polymeric Materials (4)	
Approved El	ective (1)	
Liquid Crysta	al Engineering Electives (choose from the concentration courses) (6)	
Liquid Cryst	al Engineering Concentration (23 credit hours)	
CPHY 62454	Liquid Crystal Optics III: Applications (1) inactivated	
CPHY 65002	Liquid Crystal Device Engineering I (2) inactivated	
CPHY 65004	Liquid Crystal Device Engineering II (3) inactivated	
CPHY 65006	Liquid Crystal Device Prototyping (2)	
CPHY 65008	Liquid Crystal Device Construction (1)	
CPHY 65010	Liquid Crystal Characterization (2) inactivated	
CPHY 65012	Liquid Crystal Device Testing (2) inactivated	
CPHY 65020	Liquid Crystal Analog Electronics (2) inactivated	
CPHY 65022	Liquid Crystal Digital Electronics (2) inactivated	
CPHY 65098	Master's Project: Engineering Applications of Liquid Crystals (6)	
	Minimum Total Credit Hours	30-38

M.S. Proposed Curriculum		Credits
Major Requirements (12 credit hours)		
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
Culminating R	equirement (6 credit hours)	
Choose from the	he following:	6
MTSC 60199	) Thesis I (6)	
MTSC 65098	Master's Project: Engineering Applications of Liquid Crystals (6)	
Approved Elec	ctives (12 credit hours)	
Choose from the	he following:	12
BSCI 50158	Molecular Biology (3)	
BSCI 50220	Bioinformatics (3)	
BSCI 51120	Biological Light Microscopy (3)	

Kent State University | Name and Curriculum Change Request | M.S. and Ph.D. Chemical Physics | Page 5

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. Propose	d Curriculum (changes are marked)	Credits
Major Requireme	ents (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 L <sup>1</sup>	30
Approved Electiv	ves (18-48 credit hours)	50
Choose from the	followina:	18-48
BSCI 70158	Molecular Biology (3) added	
BSCI 70220	Bioinformatics (3) added	
BSCI 71120	Biological Light Microscopy (3) added	
CHEM 70352	Inorganic Materials Chemistry (3) added	
CHFM 70451	Organic Materials Chemistry (3) added	
CHFM 70478	Synthesis of Organic Liquid Crystals (3) added	
CHEM 70559	Nanomaterials (3) added	
CHEM 70571	Surface Chemistry (2) added	
CHEM 70254	Biomembranes (2) added	
MTSC 72241	Statistical Mechanics of Soft Matter (3) revised	
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)	revised
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) added	
PHY 78401	Liquid Crystal Physics (3) added	
Additional cou	irses with advisor approval	
	Minimum Total Credit Hours for Post-Baccalaureate Studen	ts: 90
	Minimum Total Credit Hours for Post-Master's Studen	ts <sup>.</sup> 60

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



November 8, 2019

To Whom It May Concern,

This letter is to document the support of Biological Sciences for the revision of the MS in Chemical Physics to be renamed Materials Science and the associated curricular changes.

We are enthusiastic about this revision and we look forward to the success of this degree program and tis students.

Sincerely,

Lan Ly

Laura G. Leff Professor, Chair Biological Sciences

CPHY 67

**Department of Biological Sciences** 



**Department of Chemistry and Biochemistry Correspondence** 

Date: December 6, 2019 To: Dean James Blank From: Professor and Interim Chair, Christopher J. Fenk Subject: Materials Science Program

Dear Dean Blank,

Pursuant to our recent discussions regarding the revision of the MS in Chemical Physics to be renamed Materials Science along with the associated curricular changes, let this letter confirm the enthusiastic support of the Department of Chemistry and Biochemistry. We look forward to the success of this degree program and its students.

Sincerely yours,

Christopher J. Fenk, Ph.D. Professor and Interim Chair

Department of Chemistry and Biochemistry P.O. Box 5190 • Kent, Ohio 44242-0001 330-672-0032 • Fax: 330-672-3816 • http://www.kent.edu/chemistry