

**TO:** The Engineering Faculty  
**FROM:** The Faculty of the School of Materials Engineering  
**DATE:** March 3, 2017  
**RE:** New course in the Materials Engineering curriculum (B.S.MSE)

The faculty of the School of Materials Engineering has approved a new course entitled MSE 42000: "Structure and Properties of Organic Materials" as part of the B.S.MSE core curriculum. This course addresses the need for a broader polymeric content in the MSE undergraduate courses.

The course goals and learning objectives are fully detailed in the attached supporting documents and are briefly summarized here as:

Upon completion of the course, students will: (1) have a basic understanding of fundamental organic chemistry and polymer synthesis, (2) be able to explain the physical structure of organic materials at different length scales (molecular to macro-scale), and (3) relate the differences in the chemical and physical structure of organic materials to differences in their properties (thermal, mechanical, and optical).

This course has been taught as MSE 49700 during spring semesters of 2016 and 2017 and will replace CHM 25700: "Organic Chemistry" in the current plan of study. By replacing CHM 25700 (4 credit hours) with the proposed course MSE 42000 (3 credit hours), a decrease to 125 credit hours will be required for graduation with a B.S. in Materials Engineering.



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David F. Bahr, Professor and Head  
School of Materials Engineering

## Current

### Minimum Degree Requirements For Materials Engineering

Credit Hours Required for Graduation: 126

<i>Courses</i>	<i>Credit Hours</i>
<b>Mathematics and Physical Sciences</b>	
Calculus: MA 16500, 16600, 26100, 26500, and 26600	18
Chemistry: CHM 11500, 11600, 25700	12
Physics: PHYS 17200, 24100, 25200	8

### General Education Program

#### *Foundational Learning Outcomes:*

(Courses approved by the Undergraduate Curriculum Council)

Written Communication/Information Literacy: ENGL 10600 or equiv.	3
Oral Communication: COM 11400	3
Humanities	3
Behavior/Social Science	3
Science, Technology, & Society	3
<b>General Education Electives:</b>	9

Electives are selected from approved lists with MSE faculty guidance subject to the programmatic requirements of the College of Engineering General Education Program.

#### **Seminars**

MSE 39000 (semesters 3-8) 0

#### **Core Engineering Courses**

ENGR 13100, 13200 4  
or ENGR 14100 and 14200  
MSE Core: 23000, 23500, 25000, 26000, 27000, 33000, 33500, 34000, 36700, 37000, 38200, 43000, 44000, and 44500. 42

Integrated MSE courses, including year-long, industry-sponsored senior design projects, on the structure, properties, processing, and performance of engineering materials.

#### **Technical Electives** 18

A plan of study is designed with the help of a faculty advisor to meet each individual student's professional goals. At least 12 of the 18 credits must be approved materials-specific courses; the remaining 6 credits may be selected from an approved list of courses, including other academic disciplines.

## Proposed

### Minimum Degree Requirements For Materials Engineering

Credit Hours Required for Graduation: 125

<i>Courses</i>	<i>Credit Hours</i>
<b>Mathematics and Physical Sciences</b>	
Calculus: MA 16500, 16600, 26100, 26500, and 26600	18
Chemistry: CHM 11500, 11600	8
Physics: PHYS 17200, 24100, 25200	8

### General Education Program

#### *Foundational Learning Outcomes:*

(Courses approved by the Undergraduate Curriculum Council)

Written Communication/Information Literacy: ENGL 10600 or equiv.	3
Oral Communication: COM 11400	3
Humanities	3
Behavior/Social Science	3
Science, Technology, & Society	3
<b>General Education Electives:</b>	9

Electives are selected from approved lists with MSE faculty guidance subject to the programmatic requirements of the College of Engineering General Education Program.

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Integrated MSE courses, including year-long, industry-sponsored senior design projects, on the structure, properties, processing, and performance of engineering materials.

#### **Technical Electives** 18

A plan of study is designed with the help of a faculty advisor to meet each individual student's professional goals. At least 12 of the 18 credits must be approved materials-specific courses; the remaining 6 credits may be selected from an approved list of courses, including other academic disciplines.

# Impact of the Junior Year for Material Engineering Students

## Current MSE plan of study (3<sup>rd</sup> year)

### Fifth Semester

- (3) MSE 33500 (Materials Characterization Laboratory)  
*Pre-MSE 23500*
- (3) MSE 34000 (Transport Phenomena)  
*Pre-MA 26600 (or MA 26200)*
- (3) MSE 37000 (Elec, Opt, and Mag. Props. of Materials)  
*Pre-MSE 23000, MSE 27000, PHYS 24100 (or PHYS 27200)*
- (4) CHM 25700 (Organic Chemistry)
- (3) General Education Elective
- (0) MSE 39000 (Seminar)
- (16)

### Junior Year

### Sixth Semester

- (3) MSE 33000 (Proc. and Props. of Mats.)  
*Pre-MSE 26000*
- (3) MSE 36700 (Materials Processing Laboratory)  
*Pre-MSE 26000*
- (3) MSE 38200 (Mechanical Response of Materials)  
*Pre-MSE 25000, MA 26500 (or MA 26200)*
- (3) Technical Elective
- (3) General Education Elective
- (0) MSE 39000 (Seminar)
- (15)

## Proposed MSE plan of study (3rd year)

### Fifth Semester

- (3) MSE 33500 (Materials Characterization Laboratory)  
*Pre-MSE 23500*
- (3) MSE 34000 (Transport Phenomena)  
*Pre-MA 26600 (or MA 26200)*
- (3) MSE 37000 (Elec, Opt, and Mag. Props. of Materials)  
*Pre-MSE 23000, MSE 27000, PHYS 24100 (or PHYS 27200)*
- (3) General Education Elective
- (3) General Education Elective
- (0) MSE 39000 (Seminar)
- (15)

### Junior Year

### Sixth Semester

- (3) MSE 33000 (Proc. and Props. of Mats.)  
*Pre-MSE 26000*
- (3) MSE 36700 (Materials Processing Laboratory)  
*Pre-MSE 26000*
- (3) MSE 38200 (Mechanical Response of Materials)  
*Pre-MSE 25000, MA 26500 (or MA 26200)*
- (3) Technical Elective
- (3) MSE 42000 (Structure and Properties of Organic Materials)
- (0) MSE 39000 (Seminar)
- (15)

# MSE 49700-001

## Structure & Properties of Organic Materials

**Prof. Kendra Erk**  
Office: WANG 4502  
Phone: (765) 494-4118  
Email: erk@purdue.edu  
Office Hours/TA: TBD

**Course Information**  
Spring 2017  
Tues. and Thurs., 3:00-4:15 pm  
ARMS 1103

### Course Description

This course presents information on the chemical and physical structure and basic material properties of organic materials. Content on synthetic materials (including commodity plastics and specialty polymers) will be incorporated as well as on select natural materials (e.g., polysaccharides, proteins, lipids). The course is structured as follows: ~ 6 weeks on chemical structure, ~ 5 weeks on physical structure, and ~4 weeks on material properties. The course will meet twice weekly and the final grade in the course will be based on a weighted average of homework and tests. The target audience of this course is junior and accelerated sophomore undergraduate students in materials engineering. For Spring 2017, this course counts towards graduation as a Technical Elective within materials engineering (if you have already taken CHM 257 or equivalent) OR as your organic chemistry graduation requirement within MSE (if you have not already taken CHM 257 or equivalent).

### Course Goals

1. This course will build upon introductory information on materials science as presented in MSE 230 and MSE 235 and will prepare students to be successful in higher-level polymer and soft material elective courses in materials engineering, chemical engineering, and chemistry.
2. This course will present fundamental concepts of organic chemistry, specifically tailored to materials engineering students.
3. This course will discuss how the chemical and physical structures of organic materials directly impact the properties of bulk materials over multiple length scales, from the molecular-level to the macroscale.

### Learning Objectives

By the end of this course, the student will be able to do the following:

1. Describe atomic-scale bonding in organic materials.
2. Identify common hydrocarbon units in organic molecules and describe common organic reactions involving those units.
3. Select the appropriate characterization techniques for chemical structures, physical structures, and bulk material properties and interpret basic data from selected techniques.
4. Explain how macromolecules are synthesized and outline the most common synthesis reactions.
5. Distinguish between chemical and physical structures of organic materials and classify different structures into appropriate material length scales.
6. Distinguish between molecular, microscale, and macroscale mechanical behavior of organic materials.
7. Explain the relationship between an organic material's chemical structure, physical structure, and its bulk properties, using phenomenon from multiple length scales.

**Required Texts:** There is no required textbook for this course. When necessary, students will be provided with reading and slides, available through the Blackboard course website.

## Course Logistics

After most Thursday lectures, students will complete a homework assignment that will be discussed in class during the following Tuesday lecture. Students will submit their homework assignments by the evening before the next lecture, using the appropriate submission link on the Blackboard course website. Additionally, students should bring a copy (hard or electronic) of their assignments to lecture, as most of the time these assignments will be discussed in class and no answer key will be posted – hence, it is important to attend every lecture.

## Policies

### General Course Policies

Students are responsible to know the information contained in this syllabus. It is expected that students attend and actively participate in all course lectures. All individuals will treat each other with respect and courtesy at all times. Students should arrive on time to each lecture and refrain from leaving early, in order to minimize disruption to Prof. Erk and other students in the course. Additionally, students should minimize disruptive behavior while in class, such as excessive talking, laughing, texting, and web-surfing. All course announcements will be made in class and posted on Blackboard. Lastly, Prof. Erk retains the right to ask disruptive or disrespectful students to leave the classroom at any point.

### Grading

Four In-Class Tests	60% (15% each)
Homework Assignments	30%
Projects and “other” (surveys, etc.)	10%

Grades will be assigned using the above weighting and the scale shown here. Prof. Erk reserves the right to make slight alterations to the grading scale based on class performance. Four in-class tests will be given. Class attendance and participation during lecture will be taken into account when students are on a borderline between grades. Students are responsible for checking the accuracy of the gradebook (which will be maintained on Blackboard) – notify Prof. Erk if you believe there are discrepancies or missing grades.

Grading Scale			
A	95%	C+	70%
A-	90%	C	65%
B+	85%	C-	60%
B	80%	D+	55%
B-	75%	D	50%

### Attendance

Attendance will NOT be tracked; however, to do well in this course, you should attend and participate in all lectures. Absences are only “excused” for the following *verifiable* reasons: serious illness, family or personal emergencies, religious observations, or official University or MSE-departmental business. If you need to miss a test for one of these reasons, you should make arrangements with Prof. Erk *prior* to your absence. For unanticipated or emergency absences when advance notification to Prof. Erk is not possible, the student should contact Prof. Erk as soon as possible by email. More information can be found here: <http://www.purdue.edu/advocacy/students/absences.html>.

### Missed or Late Work

Unless you have an “excused” absence (see above), you will *not* be able to make-up any missed in-class activities or tests. Late homework assignments are only accepted if submitted before the next lecture and will suffer a 10% reduction of the total available points. Assignments submitted after that point will not be graded.

### Feedback to Prof. Erk

Students are encouraged to provide written or oral feedback to Prof. Erk about this course and its contents at any point during the semester. Students are also encouraged to complete the end-of-semester course evaluations with honest and constructive feedback about the strengths and weaknesses of both the course and the instructor. All feedback is read and considered by Prof. Erk and will be useful in the continual assessment and redesign of this course in the future. Thank you in advance for your feedback.

### Emergencies

In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Information about changes in this course will be posted on Blackboard and/or distributed via email to your @purdue.edu email address.

Emergency preparedness is your personal responsibility. Purdue University is actively preparing for natural disasters or human-caused incidents with the ultimate goal of maintaining a safe and secure campus. For full details, visit: [http://www.purdue.edu/ehps/emergency\\_preparedness/](http://www.purdue.edu/ehps/emergency_preparedness/)

- For any emergency call 911.
- There are nearly 300 Emergency Telephone Systems throughout campus that connect directly to the Purdue Police Department (PUPD). If you feel threatened or need help, push the button and you will be connected to the PUPD.
- If we hear a fire alarm we will immediately evacuate the building and proceed outside. Do not use the elevator.
- If we are notified of a Shelter in Place requirement for a tornado warning we will shelter in the lowest level of this building away from windows and doors.
- If we are notified of a Shelter in Place requirement for a hazardous materials release or civil disturbance we will shelter in our classroom shutting any open doors and windows.
- ARMS Building Emergency Plan  
[https://www.purdue.edu/ehps/emergency\\_preparedness/bep/arms-bep.html](https://www.purdue.edu/ehps/emergency_preparedness/bep/arms-bep.html)

### Academic Integrity

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." See <https://www.purdue.edu/odos/academic-integrity/index.html>. Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing [integrity@purdue.edu](mailto:integrity@purdue.edu) or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. Forms of cheating in MSE 497 that will not be tolerated include copying during examinations, illegal crib sheets, willingly sharing answers or facilitating cheating, copying/sharing homework solutions, copying text from websites/books/other resources, etc. It is okay to work together on homework assignments or class projects; however, all students should complete their own homework assignments with unique answers/figures/cartoons, etc.

### Use of Copyrighted Materials

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally. Notes taken in class are, however, generally considered to be

“derivative works” of the instructor’s presentations and materials, and they are thus subject to the instructor’s copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor.

### **Grief Absence Policy for Students**

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student’s family. For more information, contact the Dean of Students directly: <https://www.purdue.edu/odos/>

### **Violent Behavior Policy**

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity. To report any incidents (or students) of concern, click on the “Report Concerns” menu at <https://www.purdue.edu/odos/> and complete a general (or specific) incident report.

### **Students with Disabilities**

Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University. If you have a disability that requires special academic accommodation, please make an appointment to speak with Prof. Erk within the first three (3) weeks of the semester in order to discuss any adjustments. It is the student's responsibility to notify the Disability Resource Center (<http://www.purdue.edu/drc>) of an impairment/condition that may require accommodations and/or classroom modifications.

### **Nondiscrimination**

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in [Executive Memorandum No. D-1](#), which provides specific contractual rights and remedies. Any student who believes they have been discriminated against may visit [www.purdue.edu/report-hate](http://www.purdue.edu/report-hate) to submit a complaint to the Office of Institutional Equity. Information may be reported anonymously.

***This syllabus is subject to change. Any and all changes during the semester will be documented on Blackboard as “announcements”. KAE 1-12-17***

# MSE - 42000 - Structure and Properties of Organic Materials

2017-2018 Course Create New Undergraduate

## General Course Information

- Originating Campus\***
- West Lafayette
  - Northwest
  - Fort Wayne
  - IUPUI

- Non-Originating Campus(es):  
(Select the correct combination of additional campuses offering this course)\***
- No other campus involved
  - West Lafayette
  - Northwest
  - Fort Wayne
  - IUPUI
  - Northwest & Fort Wayne
  - Northwest & IUPUI
  - West Lafayette & Northwest
  - West Lafayette & Fort Wayne
  - West Lafayette & IUPUI
  - Fort Wayne & IUPUI
  - Northwest, Fort Wayne, & IUPUI
  - West Lafayette, Fort Wayne, & IUPUI
  - West Lafayette, Northwest, & IUPUI
  - West Lafayette, Fort Wayne, & Northwest

**Multiple Campuses:** There is only one version of a course in the Banner catalog. All campus locations offering this course must agree. Choosing the locations above allows all involved campuses to approve the proposal.

**College/School\***

College of Engineering - WL

**Department\***

-School of Materials Engineering - WL

**Course Numbers:** All course numbers may only be used once for a course in order to allow our repeat course audit to work properly. Before submitting a form for a new course or renumber, please make sure the course number is available. Please remember Purdue



now uses 5-digit course numbers to allow more options for the departments. This may be verified through the following:

Legacy Course Catalog: <https://www.purdue.edu/registrar/legacy/catalog.cfm>

Banner Course Catalog: [https://selfservice.mypurdue.edu/prod/bwckctlg.p\\_disp\\_dyn\\_ctlg](https://selfservice.mypurdue.edu/prod/bwckctlg.p_disp_dyn_ctlg)

<b>Proposed Effective Term</b>	Spring 2018		
<b>Proposed Subject Code*</b>	MSE	<b>Proposed 5 digit course #*</b>	42000
<b>Long Title*</b>	Structure and Properties of Organic Materials		
<b>Short Title (max 30 characters)</b>			
<b>Terms offered (Select all that apply)</b>	<input type="checkbox"/> Fall <input checked="" type="checkbox"/> Spring <input type="checkbox"/> Summer		

**Credit Hour Guidelines:** Purdue's credit hour guidelines are provided below.

[http://www.purdue.edu/registrar/documents/forms/Credit\\_Hr\\_Guidelines.pdf](http://www.purdue.edu/registrar/documents/forms/Credit_Hr_Guidelines.pdf)

Please use the following two options to specify if the course credit is fixed or variable:

**Option #1: Fixed Credit Hours**

<b>Proposed Credit Hours</b>	3
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**Option #2: Variable Credit Range**

<b>Minimum</b>	
<b>Variable Credit</b>	<input type="radio"/> To <input type="radio"/> OR
<b>Maximum</b>	
<b>Course Repeat Status</b>	<input type="checkbox"/> Course may be repeated <input type="checkbox"/> Course may not be repeated
<b>If repeatable:</b>	<input type="checkbox"/> Unlimited Amount of times

Maximum Repeatable Credit Amount

**Maximum Credit Amount**

**Grade modes  
(Select all that apply)**

- Regular Grade  
 Pass/No Pass Option  
 Audit  
 Satisfactory/Unsatisfactory

If this course is crosslisted, navigate to the crosslisting icon  in the Proposal Toolbox.

Click on 'Add Crosslisting'

Select the proposal that has (crosslisting) after the course title

Update any fields that pertain to the crosslisted course

Save your changes

Navigate back to the Primary proposal by clicking on the 'View Primary' icon in the top left corner of the proposal

**Crosslisted Course/  
Equivalent Course**

**Course Fees:** The following fees are provided on the form: Coop, Lab, and Rate Request. In order to ensure the accurate fee is assessed on a course, the Bursar's Office would like to have an explanation included with the form along with the business manager's contact information if additional information is needed.

**Additional Fees:**  Yes  
 No

**Explanation of fees**

**Registration Approvals**

- Department  
 Instructor

**Attributes:  
(Select all that  
Apply)**

- Variable Title
- Honors
- Full-Time Privileges
- Half-Time Privileges
- Internship
- Coop
- Parallel Coop
- Credit by Exam

**Schedule Types/Credit Hours:** The following links will provide explanations of the schedule types and credit hours to assist in assigning accurate types to a course.

[Schedule Type Classifications](#)

[Credit Hour Guidelines](#)

Use the following instructions to add each schedule type for the course in the text box. Examples are listed below.

Schedule Types: Lecture (LEC), Recitation (REC), Presentation (PRS),  
Laboratory (LAB), Lab Prep (LBP), Studio (SD), Distance Learning (DIS), Clinic  
(CLN), Experiential (EX), Research (RES), Individual Study (IND), Practice  
Study Observation (PSO)  
Minutes per Meeting  
Number of Meetings per week  
Weeks per term

Examples: (3 credit course) LEC/50min per mtg/3mtgs per wk/16 wks per term OR (3 credit course with Lecture and Lab) LEC/50/2/16 and LAB/100/1/16

**Proposed  
Schedule Type:**

lecture/75min per meeting/2 mtgs per week/16 weeks

**Restrictions:**

If restrictions are being requested, please provide the proper Banner codes (major, program etc.) to ensure all are accurately reflected on the course. All codes may be found on our

website under [Advisors/Active PWL Major Programs](#), and [Active PWL Minors](#) links:

Restriction Types: major, program or school codes; never use more than one  
Use the words "and" or "or" when filling out form instead of commas

Restrictions List: Department, Field of Study, Class, Level, Degree, Program, Campus,  
College

**Proposed  
Restrictions:**

**Requisites:**

Requisite information can only be selected from active offerings.

Co-requisite courses are always required to be taken at the same time  
Concurrent prerequisite courses may be taken during the same semester or in  
a previous term  
600-level prerequisites are not enforced, they are added to description as  
informational text

If there is an equivalent course the department would like listed with the prerequisites, that  
specific course will need to be specified on the form in order to have it enforced through  
the system.

**Pre-Requisites:**  
D- equals the  
lowest passing  
grade, unless  
otherwise noted

**Co-Requisites**

**Course Information:**

**Course Description\***

This course presents information on the chemical and physical structure and basic material properties of organic materials, including synthetic plastics and specialty polymers and surfactants as well as select natural materials (e.g., proteins, carbohydrates, lipids). Fundamental concepts from organic chemistry will be presented along with descriptions of how the chemical and physical structures of organic molecules directly impact the properties of bulk materials over multiple length scales, from the molecular-level to the macroscale. This course will prepare students to be successful in higher-level polymer and soft material elective courses in materials engineering.

**Learning Outcomes**

1. Describe atomic-scale bonding and identify common hydrocarbon units in organic molecules and describe common organic reactions involving those units. 2. Select the appropriate characterization techniques for chemical structures, physical structures, and bulk material properties and interpret basic data from selected techniques. 3. Explain how macromolecules are synthesized and outline the most common synthesis reactions. 4. Distinguish between chemical and physical structures of organic materials and classify different structures into appropriate material length scales. 5. Explain important structure-property relationships over multiple length scales.

**Additional Course Information (if needed)****Syllabus - Attach using the directions below:**

Navigate to the Proposal Toolbox at the top of the right side.


Select the "Add Files" button 

Upload file to be attached.

**Validate and Launch Proposal**

Once you have completed all fields:

Click "Save All Changes" 

Click on the arrow  at the top of the page to launch the proposal. (Only launch the proposal after completing all necessary fields.) The proposal will now be sent on for approvals.

### WL Catalog Use Only

**Catalog  
Ownership**

**Course Type**