

**Course Title:** PRINCIPLES OF INDUSTRIAL HYGIENE

**Course Number:** ENOH 0699

**Course Pre- and Co-requisite(s):** None

**Course Location:** Piscataway, Environmental and Occupational Health Sciences (EOHSI) Rm 402

**Course Date & Time:** FALL SEMESTER 2021 - Wednesdays (6:00PM - 8:00 PM)

**Course Instructor:** Robert Laumbach MD, MPH, CIH

- Phone (908) 436-8411(cell)
- E-mail: [laumbach@eohsi.rutgers.edu](mailto:laumbach@eohsi.rutgers.edu) Please include 'ENOH 0699' in the subject line.

**Office Hours:** *By Appointment*

**Course Assistant:** *None*

**Course Website:** [canvas.rutgers.edu](https://canvas.rutgers.edu)

**Required Course Text:** Niland. "Fundamentals of Industrial Hygiene" 7<sup>th</sup> Edition, NSC, 2021.

**Course Description:** Develops skills for evaluating exposures causing occupational health problems in the industrial workplace. Emphasis will be placed on mathematical techniques to estimate exposures to chemicals, physical agents, and ergonomic hazards facing employees. Air sampling and monitoring techniques will also be introduced.

Principles of Industrial Hygiene provides a rigorous introduction to the field of industrial hygiene. The class introduces concepts, vocabulary, and methodology in the practice of industrial hygiene and identifies resource materials. Students will learn and apply various approaches to anticipating, recognizing, evaluating and controlling occupational hazards in various industries and settings. An emphasis will be placed on the basics of: air sampling, physical hazards, industrial noise monitoring techniques and controls for workplace hazards, as well as basic quantitative analysis.

**Selected Concentration Competencies Addressed:** Each Concentration identifies competencies for each degree offered.

The competencies addressed in this course for the MPH in Occupational Safety and Health include:

- Identify occupational safety and health issues in the workplace and as applicable the related exposure risks to the general public as well as to vulnerable communities or susceptible sub-populations
- Explain basic mechanisms of toxicology and dose-response regarding occupational toxicants
- Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection
- List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards

Please visit the Concentration webpages on the School of Public Health's website at [sph.rutgers.edu](https://sph.rutgers.edu) for additional competencies addressed by this course for other degrees and concentrations.

**Course Objectives:** By the completion of this course, students will be able to:

- Describe the history of industrial hygiene and its public health roots;

- Apply methods for anticipating and recognizing occupational health hazards;
- Estimate air concentrations of chemicals based on physical properties and workplace conditions;
- Apply basic calculations to estimate exposures and dose;
- Evaluate air contaminant and noise exposures;
- Interpret and apply occupational exposures limits;
- Appraise and propose appropriate methods for controlling industrial hazards;
- Assess risk of ergonomic injuries and apply controls
- Apply the ethics of the industrial hygiene profession.

## Course Requirements and Grading:

The weekly scheduled sessions will be interactive, with brief presentations, discussions, and active problem solving. Depending on changing pandemic circumstances, parts of the course may be taught remotely. All students are required to have and use a webcam during any scheduled on-line sessions. In addition to readings assigned for preparation prior to class, on most weeks there will be a graded open-book quiz based on the readings (2 points each). To receive credit for the quizzes, which will be discussed in class, these assignments must be submitted before class at 6:00PM on the date the quiz is due. NO credit will be given for late quizzes. However, the 2 lowest grades among the 12 quizzes will be dropped. There will also be 4 problem-solving worksheets to reinforce the topic information provided in class. Late problem-solving worksheets will be automatically marked down a grade (7%). Calculations will also be done during class time. A scientific calculator will be needed (free web-based calculator is fine). Details about the course presentations, projects and assignments will be provided during the semester in class and on Canvas. All classroom presentation materials and reading assignments will be available on Canvas.

1. Quizzes (2 pt each x 10)	20 %
2. Problem-solving Worksheets (4)	20 %
3. Midterm Exam	25 %
4. Comprehensive Final Exam	25 %
5. Class Participation	10 %
Total:	100 %

- *Class participation will be graded based on attendance, active participation in completing in-class group assignments, solving practice problems for the class, and other in-class activities.*

Grading Policy (not rounded up):

94 – 100	A
90 – <94	A-
87 – <90	B+
84 – <87	B
80 – <84	B-
77 – <80	C+
<70	F

**Course Schedule:**

WEEK	DATE	COURSE TOPIC	LINK TO COMPETENCIES AND ASSESSMENTS	ASSIGNMENTS/ASSESSMENTS
Week 1	Sep 7	Syllabus and Student information Overview of Industrial Hygiene	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	Read Chapter 1 before Sep 7 class. Read Chapter 6 before Sep 14 class <b>Quiz Chapter 1 and 6, DUE before 6:00PM on Sep 14.</b>
Week 2	Sep 14	Industrial Toxicology (Ch 6)	<ol style="list-style-type: none"> <li>1. Explain basic mechanisms of toxicology and dose-response regarding occupational toxicants (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	Reading Chapters 7 Gases, Vapors, Solvents. <b>Quiz Chapter 7, DUE before 6:00PM on Sep 21.</b>
Week 3	Sep 21	Recognition of Hazards: Gases, Solvents, Vapors (Ch 7)	<ol style="list-style-type: none"> <li>1. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. Specify current environmental risk assessment approaches and methods for a particular hazard or risk in a workplace or community (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	In class exercise on Anticipation Recognition, Evaluation and Control In class practice calculations <b>Calculation Worksheet #1 (Due Oct 5)</b> Read Chapter 8 Particulate Matter <b>Quiz Chapter 8, DUE before 6:00PM on Sep 28.</b>
Week 4	Sept 28	Recognition of Hazards: Particulate Matter (Ch 8)	<ol style="list-style-type: none"> <li>1. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. Specify current environmental risk assessment approaches and methods for a particular hazard or risk in a workplace or community (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	Read Chapter 15 <b>Quiz Chapter 15, DUE before 6:00PM on Oct 5.</b>

Week 5	Oct 5	Evaluation of Hazards (Ch 15)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	Read Chapters 16 and 17 <b>Quiz Chapter 16 and 17, DUE before 6:00PM on Oct 12.</b> <b>Calculation Worksheet #1 DUE Today</b>
Week 6	Oct 12	Air Sampling and Direct Reading Instruments for Gases, Vapors and Particles (Ch 16, 17)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Midterm and Final, Quiz</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz</i>)</li> </ol>	<b>Calculation Worksheet #2 due Oct 19</b> Read Chapter 18&19 <b>Quiz Chapter 18&amp;19, DUE before 6:00PM on Oct 19.</b>
Week 7	Oct 19	Methods of Control (Ch18) Local Exhaust Ventilation (Ch 19)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Midterm and Final, Quiz, Homework</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Midterm and Final, Quiz, Homework</i>)</li> </ol>	Read chapters 20 & 21 Quiz Chapter 20 & 21 , DUE before 6:00PM on Oct 27 <b>Calculation Worksheet #2 due Today</b>
Week 8	Oct 26	Methods of control Dilution ventilation (Ch 20,21)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Final Exam, Quiz, Homework</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Final Exam, Quiz, Homework</i>)</li> </ol>	Study for Mid-Term Exam
Week 9	Nov. 2	<b>Mid-Term Exam</b>		<b>Read chapters 9</b> <b>Quiz Chapter 9, DUE before 6:00PM on Nov 9</b> <b>General Ventilation, Noise, and Radiation Problems Worksheet #3 DUE Nov. 23</b>
Week 10	Nov 9	Industrial Noise (Ch 9)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Final Exam, Quiz, Homework</i>)</li> </ol>	Read chapters 10 & 11 <b>Quiz Chapter 10 &amp; 11, DUE before 6:00PM on Nov. 16</b>

			2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards ( <i>Assessed by Final Exam, Quiz, Homework</i> )	
Week 11	Nov 16	Ionizing and nonionizing radiation (Ch 10,11)	<ol style="list-style-type: none"> <li>1. Identify occupational safety and health issues in the workplace and as applicable the related exposure risks to the general public as well as to vulnerable communities or susceptible sub-populations (<i>Assessed by Final Exam, Quiz, Homework</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Final Exam, Quiz, Homework</i>)</li> </ol>	Read Chapter 14 <b>Quiz Chapters 14 , DUE before 6:00PM on Nov 30</b>
Week 12	Nov 23	<b>No Class</b>		
Week 13	Nov 30	<b>Biological Hazards (Ch 14)</b>	<ol style="list-style-type: none"> <li>1. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Final Exam, Quiz</i>)</li> <li>2. Specify current environmental risk assessment approaches and methods for a particular hazard or risk in a workplace or community (<i>Assessed by Final Exam, Quiz</i>)</li> </ol>	Read Chapter 12 and 22 <b>Quiz Chapters 12 &amp;22, DUE before 6:00PM on Dec 7</b> <b>Homework #3 General Ventilation, Noise, and Radiation Problems DUE Today</b> <b>Homework 4 Biological, Thermal, Ergonomics and PPE due on Dec.7</b>
Week 14	Dec 7	Thermal stress (Ch 12) Respiratory Protection (Ch 22)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Final Exam, Quiz</i>)</li> <li>2. List current quantitative risk assessment approaches and methods for specific occupational safety and other health hazards (<i>Assessed by Final Exam, Quiz</i>)</li> </ol>	Read Chapters 23 and 23 <b>Quiz Chapters 13 &amp;23, DUE before 6:00PM on Dec 14</b>
Week 15	Dec 14	Ergonomics (Ch 13) and Personal Protective Equipment (Ch, 23)	<ol style="list-style-type: none"> <li>1. Apply federal and state regulatory standards which are related to worker (occupational) safety and health protection (<i>Assessed by Final Exam</i>)</li> </ol>	<b>Homework 4 DUE</b> Study for Final Exam (Comprehensive)
Week 16	Dec 21	<b>Comprehensive Final Exam</b>		

**Learning Management System:** Canvas will be used extensively throughout the s

semester for course syllabus, assignments, announcements, communication and/or other course-related activities. It is the student's responsibility to familiarize themselves with Canvas and check it regularly. If you have difficulties accessing Canvas, please inform the instructor and Canvas Support ([help@canvas.rutgers.edu](mailto:help@canvas.rutgers.edu)). Canvas is accessible at [canvas.rutgers.edu](https://canvas.rutgers.edu).

**School of Public Health Honor Code:** The School of Public Health Honor Code is found in the School Catalog ([sph.rutgers.edu/academics/catalog.html](https://sph.rutgers.edu/academics/catalog.html)). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the School community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

**Students with Disabilities:** Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student must apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at [ods.rutgers.edu](https://ods.rutgers.edu). The student will also be required to participate in an ODS intake interview and provide documentation. If reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

**Commitment to Safe Learning Environment:** The Rutgers School of Public Health is committed to helping create a safe learning environment for all students and for the School as a whole. Free expression in an academic community is essential to the mission of providing the highest caliber of education possible. The School encourages civil discourse, reasoned thought, sustained discussion, and constructive engagement. Provocative ideas respectfully presented are an expected result. An enlightened academic community, however, connects freedom with responsibility. The School encourages all students to disclose any situations where you may feel unsafe, discriminated against, or harassed. Harassment or discrimination of any kind will be not tolerated and violations may lead to disciplinary actions.

**Student Well-Being:** The School of Public Health recognizes that students may experience stressors or challenges that can impact both their academic experience and their personal well-being. If the source of your stressors or challenges is academic, students are encouraged to discuss these challenges and circumstances with their instructor, if they feel they may need additional support or temporary accommodations at the beginning or during this course. The course instructor may consider making reasonable temporary adjustments depending on the student's situation. For personal concerns or if additional support is needed, students may reach out to the [Office of Student Affairs](#) or any of the appropriate referral resources listed on the [SPH Student Connect](#) Canvas page.

**Reporting Discrimination or Harassment:** If you experience any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. You may report such incidents to the [RBHS Title IX Office](#) or to the School of Public Health's [Office of Student Affairs](#). Rutgers University has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. If you experience any other form of discrimination or harassment, including racial, ethnic, religious, political, or academic, please report any such incidents to the School's [Office of Student Affairs](#). The School strongly encourages all students to report any incidents of discrimination or harassment to the School. Please be aware that all Rutgers employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers as listed in Appendix A to [Policy 10.3.12](#)) are required to report information about such discrimination and harassment to the School and potentially the University. For example, if you tell a faculty or staff member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty or staff member must share that information with the [RBHS Title IX Coordinator](#). If you wish to speak to a confidential employee who does not have this reporting responsibility, you can find a list of resources in Appendix A to University [Policy 10.3.12](#). For more information about your options at Rutgers, please visit [Rutgers Violence Prevention and Victim Assistance](#).

**Overview of School Policies:** Academic and non-academic policies and procedures, such as Auditing a Course, Retaking Courses, Grade Grievance and others that cover registration, courses and grading, academic standing and progress, student rights and responsibilities, graduation and more may be found under [Policies](#) on the School of Public Health website. Below are select specific policies; however, students are responsible for keeping informed about academic and non-academic policies and procedures beyond those noted on this syllabus.

**Graduate Student Computer Policy:** Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at: [sph.rutgers.edu/student-life/computer-support.html](http://sph.rutgers.edu/student-life/computer-support.html)

**Policy Concerning Use of Recording Devices and Other Electronic Communications Systems:** When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.

**Policy Concerning Use of Turnitin:** Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com (directly or via learning management system, i.e. Canvas) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

**Withdrawal/Refund Schedule:** Students who stop attending their course(s) without submitting a completed [Add/Drop Course](#) form will receive a failing grade. Furthermore, students dropping to zero credits for the semester are considered withdrawn and must submit a completed [Leave of Absence](#) form from the School of Public Health's Office of Student Affairs. The School of Public Health refunds tuition only. Administrative and technology fees are non-refundable. You may find the Withdrawal/Refund Schedule on the School of Public Health website at: [sph.rutgers.edu/academics/academic-calendar.html](http://sph.rutgers.edu/academics/academic-calendar.html)



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