

PUBHEHS 4330 (U, undergraduate) /PUBHEHS 6330 (GU, graduate)

Environmental Epigenetics

3 credits – Spring

Online, Asynchronous

Course Instructor

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Instructor's Office Hours

Thursday, 11:00 am – 12:00 pm by appointment (via Zoom)

Faculty Feedback & Response Time:

The following gives you an idea of my intended availability during the course:

- **Grading:** You can generally expect feedback within 7 days.
- **E-mail:** I will reply to e-mails (sent via Carmen or OSU email) within 2 school days.

Course Description

Epigenetics is an exciting and rapidly advancing field with growing relevance in molecular biology, epidemiology, environmental science, and public health. It focuses on the biological mechanisms that influence gene expression without altering the DNA sequence to understand gene-environmental interactions. An individual's epigenetic patterns can change over time in response to environmental exposures, lifestyle factors, and social determinants of health, providing a vital link between nature and nurture. For example, identical twins with the same genetic makeup may differ in their susceptibility to certain diseases due to epigenetic differences. Understanding these processes is essential for identifying how environmental, lifestyle, and behavioral factors contribute to disease risk and health disparities. This course provides a strong foundation in epigenetics, exploring the mechanisms that regulate gene expression, key laboratory methods, and research applications in molecular biology, epidemiology, environmental science, and public health.

Prerequisites

Undergraduate-level biology (e.g., Biology 1101 or 1110), related discipline or permission from the instructor

Course Learning Objectives

- 1) Describe general concepts of epigenetics, including DNA methylation, histone modifications, and microRNAs;
- 2) Compare and contrast the study of genetics and epigenetics;
- 3) Evaluate various technologies for DNA methylation analyses and their use in epidemiology, environmental health sciences, molecular biological sciences, and public health;
- 4) Describe the importance of the relationship between environmental exposures, lifestyle, and epigenetics;
- 5) Summarize how environmental toxicants affect aging and human diseases; and,
- 6) Apply epigenetic biomarkers for environmental exposure in epidemiology, environmental sciences, and molecular biological sciences.

Competencies:

Undergraduate Program Competencies

Foundational Public Health Knowledge Objectives

- The foundations of biological and life sciences (2).
- The underlying science of human health and disease, including opportunities for promoting and protecting health across the life course (6).

Foundation Competencies

- Communicate public health information, in both oral and written forms, through a variety of media and to diverse audiences (6).

Graduate Program Competencies-All graduates of the MHA, MPH, MS and PhD degree programs

- Explain the effects of environmental factors on a population's health (7).
- Explain biological and genetic factors that affect a population's health (8).

MPH: Foundational Competencies

- Apply epidemiological methods to the breadth of settings and situations in public health practice (1).
- Interpret results of data analysis for public health research, policy or practice (4).

MPH: Specialization in Environmental Health Sciences

- Outline the health challenges that natural and anthropogenic contaminants in the environment can pose to population health (1)
- Explain the physiological factors that influence human exposure and the uptake of chemical and biological environmental agents (2).

MS: Specialization in Environmental Public Health

- Synthesize literature in the student's area of specialization relative to their thesis topic and its importance for public health (1).
- Conduct a research project using appropriate research methods and ethical approaches (3).
- Communicate in writing and orally a research project's methods, results, limitations, conclusions and public health relevance (5).
- Explain individual and community susceptibility and vulnerability factors that heighten the risk for populations for adverse health outcomes from environmental hazards (6).

PhD: Specialization in Environmental Public Health

- Quantify individual and community susceptibility and vulnerability factors that heighten the risk for populations for adverse health outcomes from environmental hazards (7).

A complete list of College of Public Health Competencies is located on the College of Public Health website: <https://cph.osu.edu/students/competencies>.

Text/Readings:

There is no required textbook for this course. For those who want some broader background reading, an optional book is "Environmental Epigenetics," Su, L. Joseph, Chiang, Tung-chin (Eds.) (ISBN 978-1-4471-6678-8)

Carmen

There is a Carmen site for this course: <https://carmen.osu.edu>. All course materials are available via Carmen.

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (<https://admin.resources.osu.edu/buckeyepass/adding-a-device>)
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (<https://admin.resources.osu.edu/buckeyepass/installing-the-duo-mobile-application>) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Class Format: How this course works

- **Mode of delivery:** This course is a 100% online distance learning (DL) course (asynchronous). There are no required sessions when you must be logged in to Carmen at a scheduled time. Students should take a syllabus quiz during the first week and get 90% correct at the beginning of the semester using a Canvas Quiz in order to access the course materials.
- **Pace of online activities:** There are 15 weekly and asynchronously delivered course sessions consisting of topic-specific modules for a total of 160 minutes equivalent instruction time per module. Each module includes two related topics. All course activities and resources can be found through our course website on Carmen Canvas. We will touch on many different topics during the semester; however, we will not cover any one topic in-depth. This class incorporates (1) weekly recorded lectures and/or related videos, (2) online weekly quizzes, (3) weekly practice activities, (4) homework assignments, (5) weekly discussion boards, and (6) additional readings. Please note: It is a self-paced online course that does not mean self-study. Students must log into course sites regularly and interact through the class discussion boards and on projects and assignments. Overall, earlier modules include more basic concepts of environmental epigenetics and methods to understand the later modules for real-research applications.

This is an entirely online course and is divided into weekly modules (i.e., there are no times at which we all gather together in person or virtually). The design allows for more flexibility, but it also puts more responsibility on you to effectively manage your time and learning. Therefore, please plan well and always try to get course activities and assignments done well ahead of the due date to avoid something that may occur unexpectedly at the last minute. You should plan to spend a minimum of 9 hours each week on this course and log in multiple times per week to the site on Carmen. These expectations are further discussed in this syllabus.

Biology or relevant courses are required to take this course to succeed in your learning in this course. If you feel in need of refreshing, I recommend reviewing relevant textbooks and materials from the biology class you took. Each individual would have a different need, so please feel free to contact me for additional materials for your needs.

- **Credit hours and work expectations:** University rules stipulate that a student can expect to spend a minimum of approximately 3 hours per week on a course for each credit hour; thus, for this 3 credit hour course, you should expect to devote 9 hours per week total for the combination of class instructional time and outside homework. Workload will vary from week to week, with some weeks having more assignments and others having more active learning time. This is intended as a rough guide to help you plan your time accordingly. In a typical week, you can expect your time to be spent as follows:
 - 3 hours – viewing pre-recorded lectures and related videos and practice activities
 - 1 hour – completing weekly online quizzes
 - 3 hours – completing weekly reading and homework assignments
 - 1 hour – reviewing supplement materials
 - 1 hour- completing discussion assignment
- **Attendance and participation requirements:** Your attendance is required and is based, at least in part, on your online activity and participation using Carmen. Student access to posted course modules and content will be tracked to ensure ongoing access, activity, and productivity. University rules require students to participate in the online activity at least once per week. To meet this requirement, you will need to participate in discussion boards, take quizzes, submit activities and assignments. Due dates are listed in the module (see Table 1)

Course Technology

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Required equipment

- **Computer:** current Mac (Mac OSX) or PC (Windows 10+) with high-speed internet connection
- **Calculator:** Students should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation.
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Optional equipment (for participation in optional live office hours and/or review sessions)

- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone

Required software

- **Microsoft 365 Copilot (formerly Office 365)**
All Ohio State students are now eligible for free Microsoft 365 Copilot (formerly Office 365). Full instructions can be found at go.osu.edu/office365help.

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** <http://it.osu.edu/help>
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu

Honorlock, an online proctoring tool, will be used for Exams 1 and 2 in this course. Honorlock offers you flexibility to take your exams at the time and in the location of your choosing during the exam's availability window. Note: You will be given the opportunity to take the practice quiz with Honorlock before an exam.

- Technology requirements: Students are required to have a webcam (USB or internal) with a microphone, allow for screen recording, and have a strong and stable internet connection. In addition, the full Chrome browser version 120+ is required to install the Honorlock Chrome Browser extension. Honorlock is incompatible with tablets or mobile devices.
- Testing environment: During the course of an exam, Honorlock will record the testing environment. Therefore, students should select private spaces for the exam session where disruptions are unlikely and where recording devices can be enabled. Instructions for Honorlock use will be provided.
- Limitations: To use Honorlock you must be over 18 years of age or have the Online Course Recording Waiver on file. Additionally, some students with disabilities will experience barriers and need [alternative proctoring arrangements](#). Students who rely on screen readers, keyboard navigation, and voice control will face barriers. Students with low vision, reduced contrast sensitivity or who need to adjust text or line spacing may also experience barriers.
- Academic integrity and academic misconduct: Please note that while Honorlock settings may flag suspected cheating during exams, these automatic measures do not constitute a determination of academic misconduct. Any suspicion of misconduct will be referred to the [Committee on Academic Misconduct](#) and evaluated through a fair and transparent process.
- Students may request an in-person proctoring alternative to Honorlock or other online proctoring tools. The student is expected to contact the instructor as soon as possible to coordinate the accommodation.
- Students will not be permitted to take remotely proctored exams in their homes or residence halls unless they are willing to conduct a room scan. By choosing to take the exam in their home or residence hall, the student is consenting to the room scan of the area in which they take the exam.

Honorlock support is available 24/7/365. If you encounter any issues, you may contact them through live chat on the [support page](#) or within the exam itself. You can also reach out to carmen@osu.edu or call 614-688-4357 (HELP) and talk to the Learning Systems team.

Assignments/Assessments

Each topic's overview page has a detailed Roadmap, listing the items in the module and the work you must do. All materials for a module will be simultaneously available every Monday at 9 am for the entire week so that students can complete assignments at times that best fit their schedules.

Lectures (UG and G): For each topic taught in this course, you will be required to watch pre-recorded lectures, slides, or videos and to read the related materials. Each topic will include two sub-topics (see Table 1 below).

Participation (Weekly Discussion Boards, 2 points/week) (UG and G): This class will utilize discussion boards to foster critical thinking skills. You must respond to the prompt questions posted by the instructor on the discussion board. In addition to posting each week, you are required to respond substantively to one or more of your classmates' posts. You are required to post your original reply first before seeing the posts of others. Everyone is expected to follow the discussion throughout the week. Your writing should be your own original work. Grading will be based on a 0, 1, 2 scale: 0 indicates that the participation was not completed, or the effort was unacceptable; a 1 reflects moderate effort; a 2 reflects the expected level of effort.

Weekly Quizzes (7 points/week) (UG and G): Each lecture has an associated short online multiple-choice Weekly Quiz (taken via Carmen) to help reinforce understanding of the covered concepts. Students may take up to two attempts at each Weekly Quiz; if two attempts are taken, then the Weekly Quiz score will be the higher of the two. Please note that Weekly Quiz questions may be slightly different on the second attempt. A student cannot pause the Weekly Quiz, logout/log-in, and resume at a later time. Weekly Quizzes must be completed without the help of other individuals, but notes are okay.

Weekly Practice activities (2 points/week) (UG and G): Each lecture will include practice activities in various forms. The activities will be essential to understand underlying mechanisms of epigenetic control of gene expression (i.e., DNA methylation, histone modifications, and microRNAs), major laboratory methods including omics-based approach, and research applications in molecular biology, epidemiology, and the environmental sciences. The specific details of each assignment will be provided in each module. Grades will not be based on the accuracy of the responses but will reflect effort. Grading will be based on a 0, 1, 2 scale: 0 indicates that the assignment was not completed, or the effort was unacceptable; a 1 reflects moderate effort; a 2 reflects the expected level of effort. Please use the following naming configuration for your submission: **Lastname_Firstname_Practice_Week number** (e.g., Song_Min-Ae_Practice_Week 1).

Homework assignments (sequencing and scaffolding assignments) (UG and G): Throughout this course, there will be 4 homework assignments. It will be group work (2-5 students will be randomly grouped depending on the number of students). You should communicate with group members via Zoom, emails, or phones to complete each homework below. Detailed instructions will be provided in Carmen.

1. **Choosing two research articles (HW 1, 5 points):** Your group will need to select a specific topic on environmental epigenetics and read the two scientific articles with a similar topic of interest. You can use Google Scholar (<https://scholar.google.com/schhp?hl=en>) or Pubmed (<https://www.ncbi.nlm.nih.gov/pubmed/>). Potential topics will be provided in Carmen, but not limited to the example. One of the group members can submit two articles (2.5 points) in **PDF** files, but each of you should also submit a summary of your discussion (contributions) in the group meeting to choose the articles (2.5 points). Please use the following naming configuration for your submission: **Group #_Article-1_short tile of the article 1**
2. **Writing (HW 2, 20 points):** You will need to write a summary, similar to those seen in scientific journals. It should be structured one summary by synthesizing two articles, including *Background (rationale), Materials and Methods, Results, and Conclusion*. This assignment may be discussed with other classmates, but the essay must be written independently. Grading will be based on content and style. The essay should be limited to 400 words and submitted with Arial 11-point font. This will be the basis of your slides and oral presentation. Your writing should be your own original work. Each of you should write your summary of two articles chosen using your own languages. Please use the following naming configuration for your submission: **Group #_Lastname_Firstname_Writing**
3. **Drafting PowerPoint slides (HW 3, 20 points):** Your group will be uploading a PowerPoint file (for 10-12 min presentation). It should be structured, including *Title, Reference articles, Main topic of the articles, Introduction, Materials and Methods, Results, and Conclusion, Limitations, and Strengthens, and Further Study*. Template slides will be provided in Carmen. Each group submits a draft PowerPoint (10 points), but each of you should submit a summary of your contributions to the draft slides (10 points). Please use the following naming configuration for your submission: **Group #_DraftSlides**

4. **Revising PowerPoint slides (HW 4, 20 points):** Your group will be uploading revised slides based on comments and suggestions from the instructor. Each group submits a revised PowerPoint (10 points), but each of you should submit a summary of your contributions to the draft slides (10 points). Please use the following naming configuration for your submission: **Group #_RevisedSlides**

Exams (UG and G): There will be two *proctored* exams. The format of the exams will include multiple-choice, short-answer questions, True/False, and essay-type responses. The exams will be designed to take ~1 hour, but 1.5 hours will be allowed. There are no make-up exams. If you must miss an exam, please contact me as far in advance as possible to discuss alternate arrangements. Any special arrangements for exams or submitting assignments will be made entirely at the instructor's discretion. You must complete the exams yourself, without any external help or communication. This is a closed-note, closed-material exam. Accessing or referencing any notes, textbooks, or class materials during the exam is a violation of exam policy.

Summary section (30 points, 3 steps. All steps must be completed to earn full credit for assignment. Failure to do any part results in zero for assignment) (UG and G): Instead of taking the 3rd exam for the last part of the course, you will do an independent learning section. This section will include three steps as follow. **Step 1 (5 points)** requires you to choose a topic to explore in-depth. List of topics and instructions for sign up are in the assignment in Canvas. Once you have signed up, you will move on to **Step 2 (10 points)**, writing a reflection and summarizing the topic. Again, details are in the Canvas assignment. Once all students have posted Step 2 you will move on to the final step - **Step 3 (15 points)**. In this final part you will select the post of one peer and respond according to the instructions in the assignment.

Oral presentation (Final, 45 points) (UG and G): A recorded 10-12 min presentation will need to be submitted. Each of you should present at least one slide in a group presentation. Each group submits a recorded presentation, but each of you should submit (1) a summary of your contributions to the presentation and (2) a survey of peer review. Time management is as important as your presentation content. Both draft and revised slides will need to be submitted as homework (see "Homework assignments" above). The revised slides should be presented. Oral presentations will be graded based on clarity and engagement, and a survey of peer review. More detailed instructions will be given in Carmen. Please use the following naming configuration for your submission: **Group #_ Recorded PPT**

Online resource activities (5 points for each) (G only): Students will do activities by navigating useful online resources. (1) Students will design an environmental epigenetic study (including aims, hypothesis, biospecimens, predictors/outcomes, implications, and limitations/strengths). (2) Students will be asked to navigate the "The UCSC genome browser" database to search genes and epigenetic marks and answer questions regarding summary information. More detailed instructions will be given in Carmen.

Grading

Course activities are comprised of the following activities listed below and will be graded as follows: All course materials will be found on Carmen. I will utilize the grade book feature in Carmen.

For undergraduates (UG):

Items	Weight
Participation (weekly discussion boards)	10%
Weekly Quizzes	10%
Weekly Practice activities	10%
Homework Assignments (choosing articles: 2%, writing: 2%, draft slides: 3%, final slides: 3%)	10%

Exam-1	20%
Exam-2	20%
Summary section	10%
Oral presentation (final)	10%

For graduates (G):

Participation (weekly discussion boards)	10%
Weekly Quizzes	10%
Weekly Practice activities	10%
Homework Assignments (choosing articles: 2%, writing: 2%, draft slides: 3%, final slides: 3%)	10%
Exam-1	20%
Exam-2	20%
Summary section	5%
Oral presentation (final)	10%
Online activities	5%

Grading Scale

A: 93 - 100 A-: 90 – 92.9
 B+: 87 – 89.9 B: 83 – 86.9 B-: 80 – 82.9
 C+: 77 – 79.9 C: 73 – 76.9 C-: 70 – 72.9
 D+: 67 – 69.9 D: 60 – 66.9
 E: < 60

Bonus Points: Additionally, the student can earn up to 6 points. These bonus points are added to your final oral presentation points.

- Midterm Course Evaluation (+3 bonus for completing it if there is 75% participation, anonymous)
- Final Course Evaluation (SEI, +3 bonus for completing it at the end of the semester if there is 75% participation, anonymous)

If you have any questions about grading, **please send me an email at Song.991@osu.edu** (I do not use the messaging feature in Carmen)

Course Communication

Announcements

We will be using Canvas for all aspects of course management. Please check the course homepage on Canvas for announcements, clarifications, and other class materials. You are required to subscribe to “Announcements,” which will notify you via email of a new posting.

Discussion Boards

These boards will be accessible to you throughout the entire semester. It is the best way to communicate with other technical support staff or me if you have questions. The two discussion boards are as follows:

- **Questions, Clarifications, Confusions:** Sharing questions and answers is a way to help each other. Use this discussion board to ask questions about course materials being covered that week (weekly discussion board). The idea is to recreate some of the classroom benefits in the online experience. Typically, when one student asks a question, others may have the same question on their mind. I will respond and provide clarification on the discussion board to ensure that everyone has access to the same information. I will not respond to questions about course materials via email or through the messaging app in Carmen. However, if you want to schedule an appointment with me or if you

have a question about a grade, please send me a message via my email at Song.991@osu.edu so that we can find a time to meet and discuss.

Class Policies

Students are expected to complete course activities (Weekly Quizzes, practice activities, homework assignments, and discussion boards) on time. Any activities not completed by the end of the week (Sunday by 10:00 pm) will be given a 0. There are no exceptions to this rule. If you believe you may be late, have a valid excuse, and wish to request an extension, please contact me by 8 pm the night before the course activity is due. Any late in-class assignments will be assigned a score of 0 unless an excuse is pre-approved.

If you have any questions about the lecture, Weekly Quizzes, practice activities, and homework assignments, do not message me directly but rather post to the Questions, Clarifications, Confusion discussion board found in your Canvas course.

Copyright Statement

This syllabus and all course materials (e.g., homework assignments, solution keys, course materials) are under copyright by the instructor and cannot be posted elsewhere without written permission.

Generative AI Policy

Given that the learning goals of this class are aligned with the Council on Education for Public Health (CEPH) and OSU's General Elective expectations, the use of generative artificial intelligence (GenAI) tools such as Copilot or ChatGPT, or writers aids like Grammarly is not permitted in this course. Any use of GenAI tools for work in this class may therefore be considered a violation of Ohio State's Academic Integrity policy and Code of Student Conduct because the work is not your own. If I suspect that you have used GenAI on an assignment for this course, I will ask you to explain your process for completing the assignment in question. The unauthorized use of GenAI tools will result in referral to the Committee on Academic Misconduct

Office of Student Life: Disability Services

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slids@osu.edu; 614-292-3307; or slids.osu.edu.

Mental Health Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's

Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling [614-292-5766](tel:614-292-5766). CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at [614-292-5766](tel:614-292-5766) and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious Beliefs or Practices Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the [Civil Rights Compliance Office](#). (Policy: [Religious Holidays, Holy Days and Observances](#))

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee ([Faculty Rule 3335-5-48.7 \(B\)](#)). For additional information, see the [Code of Student Conduct](#).

Intellectual Diversity

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the

content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Grievances and Solving Problems

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in [Faculty Rule 3335-8-23](#), the [CPH Graduate Student Handbook](#), and the [CPH Undergraduate Student Handbook](#). Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

Online reporting form at <http://civilrights.osu.edu/>,

Call 614-247-5838 or TTY 614-688-8605,

Or Email civilrights@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Course Outline – next page

Table 1. Topics, Assignment Types, and Homework Dues

Week of (Module)	Overall Topic		Specific topics	Assignment types/Dues
(1)	A	General Concepts of Epigenetics	A1. Introduction of epigenetics A2. Epigenetics vs. Genetics	<ul style="list-style-type: none"> • Syllabus Quiz (MUST BE TAKEN) • Weekly Quiz, Discussion board, Practice activities (1/18)
(2)	B	Environmental influences on the epigenome	B1. Environmental toxicants on the epigenome B2. Review of environmental investigations	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (1/25)
(3)	C	Technologies and conduction of epigenome-wide association studies (EWAS)	C1. Overview of technologies of DNA methylation analyses C2. EWAS (Epigenome-Wide Association Study) vs. GWAS (Genome-Wide Association Study), Interpretation of data	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (2/1) • Honolock practice (2/1) • HW 1.a. (choosing 2 articles) (2/1) • HW 1.b. (summary of contribution) (2/1)
(4)	D	Tissue specificity and study design in epigenetics	D1. Use of non-target tissues in human investigations D2. Introduce statistical methods for cell type estimation	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (2/8)
(5)	E	Exam	Exam-1	<ul style="list-style-type: none"> • Exam-1 (2/15)
(6)	F	Inherited disease of the methylation machinery	F1. Inherited diseases of the epigenetic machinery F2. Genomic imprinting in mammals – mechanisms	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (2/22)
(7)	G	Epigenetics and nutrition	G1. Nutritional programming G2. Transgenerational effects	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (3/1) • HW 2 (writing assignment) (3/1)
(8)	H	Epigenetics on aging and chronic diseases	H1. Epigenetic aging clock H2. Epigenetic aging and chronic diseases	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (3/8) • Midterm course Evaluation (+ 3 bonus points) (3/8)
(9)	I	Environmental toxicants, epigenetics, and cancer	I1. Cancer epigenetics	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (3/15)

			I2. Role of epigenetic alterations in chemical carcinogenesis	<ul style="list-style-type: none"> • HW 3.a. (draft slides) (3/15) • HW 3.b. (summary of contribution) (3/15)
(10)	J	Exam	Exam-2	<ul style="list-style-type: none"> • Exam-2 (3/29)
(11)	K	Environmental epigenetics on obesity	K1. Environmental contaminants and obesity K2. The obesity paradox and DNA methylation	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (4/5)
(12)	L	Non-coding RNAs and novel topics in epigenetics	L1. Introduction to noncoding RNAs and environmental influences L2. New topics in epigenetics	<ul style="list-style-type: none"> • Weekly Quiz, Discussion board, Practice activities (4/12)
(13)	M	Environmental Mitochondriomics and Epigenetic Biomarkers	M1. Environmental toxins, mitochondrial oxidation and mutations M2: Epigenetic biomarkers	<ul style="list-style-type: none"> • Weekly Quiz (one for M1 and one for M2, 4/19), Discussion board (4/19) • Practice activities (one for M1 and one for M2, 4/19) • Summary section, Step 1 (4/19)
(14)	N	Summary section		<ul style="list-style-type: none"> • Summary section, Step 2-3 (4/26) • HW 4.a. (revise the slides) (4/26) • HW 4.b. (summary of contribution) (4/26)
(15)	O	Oral presentation		<ul style="list-style-type: none"> • Oral presentation (Final) (4/30) • Oral presentation peer review/contribution (4/30)

Table 2. Topics and Reading Materials

Week of (Module)	Overall topic		Readings materials*
(1)	A	General Concepts of Epigenetics	<ul style="list-style-type: none"> • Bob Weinhold. Epigenetics: The Science of Change. Environ Health Perspect. 2006 Mar; 114(3): A160–A167 • Goldberg AD et. al. Epigenetics: a landscape takes shape. Cell. 2007 Feb 23;128(4):635-8.
(2)	B	Environmental influences on the epigenome	<ul style="list-style-type: none"> • Hou L et.al. Environmental chemical exposures and human epigenetics. Int J Epidemiol. 2012 Feb;41(1):79-105 • Martin EM, Fry RC. Environmental Influences on the Epigenome: Exposure- Associated DNA Methylation in Human Populations. Annu Rev Public Health. 2018 Apr 1;39:309-333 • Exposome and Exposomics (CDC)
(3)	C	Technologies and conduction for DNA methylation analyses	<ul style="list-style-type: none"> • Michels K. Chapter4 laboratory methods in epigenetic epidemiology. Epigenetic Epidemiology. 2012 page37-55
(4)	D	Tissue specificity and study design in epigenetics	<ul style="list-style-type: none"> • Lokk et. al. DNA methylation profiling of human tissues identifies global and tissue-specific methylation patterns. Genome Biology. 2014; 15(4): r54 • Michels et al. Recommendations for the design and analysis of epigenome-wide association studies. Nature Methods 2013 Oct;10(10):949-55.
(5)	E	Exam	Review reading materials
(6)	F	Inherited disease of the methylation machinery	<ul style="list-style-type: none"> • Jiang et. al. Epigenetics and human disease. Annu. Rev. Genomics Hum. Genet. 2004 5:479-510 • Tang and Ho. Epigenetic reprogramming and imprinting in origins of disease. Rev Endocr Metab Disord. 2007 June ; 8(2): 173–182
(7)	G	Epigenetics and nutrition	<ul style="list-style-type: none"> • Lim and Song. Chapter 23. Dietary and lifestyle factors of DNA methylation. Cancer Epigenetics. 2012 page 359-376 • Painter et.al. Transgenerational effects of prenatal exposure to the Dutch famine on neonatal adiposity and health in later life. BJOG. 2008 Sep;115(10):1243-9
(8)	H	Epigenetics on aging and chronic diseases	<ul style="list-style-type: none"> • Pal and Tyler. Epigenetics and aging. Sci Adv. 2016 • Horvath et. al. Obesity accelerates epigenetic aging of human liver. Proc Natl Acad Sci U S A. 2014 Oct 28;111(43):15538-43
(9)	I	Environmental toxicants, epigenetics, and cancer	<ul style="list-style-type: none"> • Park. Chapter 7. Environmental toxicant, epigenetics, and cancer. Environmental Epigenetics. 2015 page 131-154

			<ul style="list-style-type: none"> • Pogribny and Rusyn. Environmental toxicant, epigenetics, and cancer. Adv Exp Med Biol. 2013 ; 754: 215–232
(10)	J	Exam	Review reading materials
(11)	K	Environmental epigenetics on obesity	<ul style="list-style-type: none"> • Su. Chapter 6. Environmental epigenetics and obesity: Evidences from animal to epidemiologic studies. Environmental Epigenetics. 2015 page 105-130 • Symonds et. al. The Obesity Epidemic: From the Environment to Epigenetics – Not Simply a Response to Dietary Manipulation in a Thermoneutral Environment. Front Genet. 2011; 2: 24
(12)	L	Non-coding RNAs and novel topics in epigenetics	<ul style="list-style-type: none"> • Karlsson and Baccarelli. Environmental health and long non-coding RNAs. Curr Environ Health Rep.2016 September ; 3(3): 178–187 • Bollati et. al. Exposure to metal-rich particulate matter modifies the expression of candidate miRNAs. Environ Health Perspect. 2010 Jun; 118(6): 763–768
(13)	M	Environmental Mitochondriomics and Epigenetic Biomarkers	<ul style="list-style-type: none"> • Roubicek et. al. Mitochondria and mitochondrial DNA as relevant targets for environmental contaminants. Toxicology. 2017. Nov 1;391:100-108 • Byun and Baccarelli. Environmental exposure and mitochondrial epigenetics: study design and analytical challenges. Hum. Genet. 2014 March ; 133(3): 247–257 • Mechanic and Hutter. Gene-Environment Interactions in Human. Environmental Epigenetics. 2015. Page 229-250 • Environmental Epigenomics: Applications of epigenetic biomarkers to investigate epigenetic alterations from environmental exposure. Environmental Epigenetics. 2015. page 251-280
(14)	N	Summary Section and HW-revised slides	<ul style="list-style-type: none"> • Review reading materials
(15)	O	Summary Session/Oral Presentation	<ul style="list-style-type: none"> • Review reading materials • Oral presentation (Final)

* Assigned readings are primary literature from recently published articles. Landmark historical articles are also indicated. Links to the PDF files of the paper can be opened by clicking on the citation through the Carmen site).

Table 3. Alignment of Course Topics, Assignments, Course Learning Objectives, and Core/Specialization Competencies

Week of (Module)	Topics	Assignments	Foundational Public Health Knowledge Objectives	Foundation Competencies	Foundation Competencies (EHS-specialization)	
(1)	A	General concepts of epigenetics	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(2)	B	Environmental influences on the epigenome	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(3)	C	Technologies, design, and conduction of epigenome-wide association studies (EWAS)	Quiz, Discussion, Practice activities, Choose a topic and two articles for presentation	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (1,5,6); PhD (7)
(4)	D	Environmental influences on the epigenome	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(6)	F	Inherited disease of the methylation machinery	Quiz, Discussion, Practice activities, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(7)	G	Epigenetics and nutrition	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(8)	H	Epigenetics on aging and chronic diseases	Quiz, Discussion, Writing assignment	UG (2,6,); G (6,8)	U (6); G (1,4)	MPH (1,4); MPH-EHS (1,2); MS (1,3,5,6); PhD (7)
(9)	I	Environmental toxicants, epigenetics, and cancer	Quiz, Discussion, Practice activities, Draft slides	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(11)	K	Environmental epigenetics on obesity	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(12)	L	Non-coding RNAs and novel topics in epigenetics	Quiz, Discussion, Practice activities	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)
(13)	M	Environmental Mitochondriomics and Epigenetic Biomarkers	Quiz, Discussion, Practice activities, Revising slides	UG (2,6,); G (6,8)	U (6); G (7,8)	MPH (1,4); MPH-EHS (1,2); MS (6); PhD (7)

(14)	N	Summary section	Summary section	UG (2,6,); G (6,8)	U (6); G (1,4)	MPH (1,4); MPH-EHS (1,2); MS (1,3,5,6); PhD (7)
(15)	O	Oral Presentation	Review reading materials, Oral presentation	UG (2,6,); G (6,8)	U (6); G (1,4)	MPH (1,4); MPH-EHS (1,2); MS (1,3,5,6); PhD (7)