Johns Hopkins University

Section 1
Instructor, Course Information & Objectives

Advanced Academic Programs
Zanvyl Krieger School of Arts and Sciences
Johns Hopkins University

AS.420.620.81.FA17: Soils in Natural and Anthropogenic Ecosystems

“The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life.”

— Wendell Berry, The Unsettling of America: Culture and Agriculture

Instructor Information
Instructor: Jerry L. Burgess, Ph.D.
Email Address: jerry.burgess@jhu.edu
Office Hours: online

Course Description
This course introduces students to basic concepts of soil science and the soil's contribution to the functions of natural and anthropogenic ecosystems. It provides an overview of soil morphological, physical, chemical, and biological properties, and how these interact to form a soil with unique characteristics and ecosystem function. Students discuss soils of the world from the perspective of soil taxonomy, the processes that form these soils, and land use properties specific to each soil order. Students learn to read soil maps, to interpret and predict the quality and land use potential of soils, and to use available soil data. A strong focus will be given to environmental and ecological issues relating to soil science in the context of the ecological relationships between soil organisms and their biotic and abiotic environments, with emphasis on the role of soil organisms in biogeochemical cycling, ecosystem structure and function, long-term ecosystem
sustainability, and global environmental change. Current issues regarding the proper use and management of soils are investigated. All sections (online and in person) will involve some field related work. Online sections will be offered every annually.

Prerequisites:
420.601 Geological Foundations for Environmental Sciences
420.611 Principles and Methods of Ecology

Course Goals & Learning Objectives

By the end of this course, you will be able to:

- Demonstrate understanding of the linkages among soil formation and development, local and regional climate and soil characteristics, and soil organisms
- Demonstrate an understanding of the relationships between soil organisms, soil physical properties, biogeochemical cycling, ecosystem functioning, and global environmental change
- Appreciate the variety and complexity of soils.
- Describe the ways in which soils are an integral component of the terrestrial ecosystem.
- Use the technical terminology associated with the description and use of soils.
- Identify soil properties important to land use, environmental quality, plant growth and society/culture.
- Demonstrate skills required to make field observations and interpretations of soils for various uses.
- Retrieve and use information from a variety of sources for land use planning and soil management decisions.
- Explain the impact of land use and management decisions on agricultural productivity and sustainability, environmental and ecological health, and land degradation.
- Understand how soils can affect everyday decisions like how to develop a garden or where to build a house.
Section 2

Course Materials

Textbook

Other Readings
All other readings will be posted on the online classroom with support from JHU reserves.

Other equipment / software/ websites / online resources
Portions of the following online teaching tool will be assigned in coordination with our class textbook:

SoilWeb200. 2017. On-line teaching tool for the APBI (formerly SOIL) 200 course, developed by Dr. Krzic’s team available at The link to this site is: [http://soilweb200.landfood.ubc.ca/](http://soilweb200.landfood.ubc.ca/)

We will perform several Virtual Labs that will use the following site: [http://soilweb.landfood.ubc.ca/labmodules/](http://soilweb.landfood.ubc.ca/labmodules/)

Others Sites of Interest:
Physical Properties of Soils Lab (under Biology and must create account): [http://www.olabs.edu.in](http://www.olabs.edu.in)

Secrets of Soil by the Smithsonian: [http://forces.si.edu/soils/](http://forces.si.edu/soils/)
Specific Technology Requirements & Skills for this Course

Though not required, access to a spreadsheet such as MS Excel, Apple Numbers or Google Docs will facilitate basic statistical analysis.

Learning online requires some basic knowledge of computer technology. At a minimum, you need to be able to:

- Navigate in and use Blackboard; the Blackboard Student Orientation course on your “My Institution” page
- Create and save MS Word documents; see MS Word tutorials for PC users (all versions); Word Help for Mac users
- Find basic resources on the Internet
- Create and organize files & folders on your computer
- Send, receive, and manage email
Section 3
Course Overview and Goals

The study of soil ecology has a long tradition. Most of this interest, until relatively recently, has been from an agricultural perspective, but now it is widely accepted that soil ecology is central to the study of terrestrial ecology. Early research in soil ecology was largely descriptive, detailing the abundance of diversity of organisms in soils of different habitats. However, interest in functional soil ecology started in the 1980s with studies of trophic interactions in soil and their importance for nutrient cycles and decomposition. Now, the topic has blossomed, with the help of new technologies that allow the study of soil organisms and their activities in situ, and there is currently widespread recognition that soil ecology is fundamental to our understanding of the functioning of terrestrial ecosystems and their response to global change.

In this course, you will learn about soils from two perspectives: basic soil science and the ecology of soils. We will explore the ecological relationships between soil organisms and their biotic and abiotic environments, with emphasis on the role of soil organisms in biogeochemical cycling, ecosystem structure and function, long-term ecosystem sustainability, and global environmental change. We will explore the fundamental principles of soil science and soils as a natural resource. You will be introduced to the physics, chemistry, microbiology, morphology, fertility and management of soils, and to the processes driving soil formation. The major soil types of the world and their classification will be discussed, and the relation of major soil characteristics to soil productivity, conservation and sustainability will be addressed.

Each week, you’ll also have assignments to complete on the online classroom, including quizzes, virtual labs, at home live labs, and discussion activities. The quizzes will involve multiple choice and short answer questions, and they are designed to get you thinking more deeply about key concepts in the readings. Soil science and soil ecology, as a natural science attempts to explain, interpret and predict nature’s phenomena. Such work often begins with observations obtain in the field which lead to further investigation. As an online class, we will attempt to incorporate the field aspect through virtual labs and “at home” data collection as part of an independent research project. Other activities will involve sharing observations and opinions with other students online.
Course Topics, Activities and Schedule

The following is a tentative Schedule of Topics and the associated reading from the text. Topics may be modified by the instructor, though advanced of no less than 2 days will be conveyed via the online classroom.

<table>
<thead>
<tr>
<th>Module</th>
<th>Course Subject</th>
<th>Assignments</th>
<th>Reading From Textbook</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction – Course Content</td>
<td>• Discussion Forum Introductions</td>
<td>Chapters 1 and 2</td>
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<td></td>
<td></td>
<td>• Policy Paper Proposal (4 weeks to complete)</td>
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<td></td>
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<td>• Site Selection</td>
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<td></td>
<td></td>
<td>• Soil Concept Map</td>
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<td></td>
<td></td>
<td>• View Lecture</td>
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<td></td>
<td></td>
<td>• Read Journal Article</td>
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<td></td>
<td></td>
<td>• Read Lecture Synopsis</td>
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<td></td>
<td>• Quiz</td>
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<td>2</td>
<td>Soil in the Environments, Pedogenesis</td>
<td>• Policy “Reading”</td>
<td>Chapters 3 and 4.</td>
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<td>and CLORPT</td>
<td>• Blog Assignment</td>
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<td>• Lecture</td>
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<td></td>
<td></td>
<td>• Lecture Synopsis</td>
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<td></td>
<td>• Quiz</td>
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<td>3</td>
<td>Physical Properties of Soils</td>
<td>• Discussion Forum Soil Physical Properties and Water Drop</td>
<td>Chapter 4 and 5</td>
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<td></td>
<td></td>
<td>• Policy Paper Proposal (2 weeks to complete)</td>
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<td></td>
<td></td>
<td>• Site Selection Blog and associated outdoor digging!</td>
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<td></td>
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<td>• View Lecture</td>
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<td></td>
<td></td>
<td>• Read Journal Article</td>
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<td>• Read Lecture Synopsis</td>
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<td>• Discussion Board #2 - Post 1 comment on impressions of the journal article</td>
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<td>• Quiz</td>
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<td>4</td>
<td>Soil Sampling and Water Movement and</td>
<td>• Discussion Forum</td>
<td>Chapter 6</td>
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<td>Behavior</td>
<td>• View all Videos in the readings and resources section</td>
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<td></td>
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<td>• Policy Paper Proposal</td>
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<td>• Site Moisture Evaluation</td>
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<td>• Updated the Site Soil Blog</td>
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<td>Week</td>
<td>Topic</td>
<td>Activities</td>
<td>Chapter</td>
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<td>5</td>
<td>Life in the Soil</td>
<td>• View Lecture &lt;br&gt; • Read Journal Article &lt;br&gt; • Read Lecture Synopsis &lt;br&gt; • Quiz &lt;br&gt; • Reading Nonnative Earthworms. &lt;br&gt; • Lecture &lt;br&gt; • Blog Assignment &lt;br&gt; • Threaded Discussion on Terra Preta Sanitation &lt;br&gt; • Lecture Synopsis &lt;br&gt; • Policy Paper submittal &lt;br&gt; • Quiz</td>
<td>Chapter 12</td>
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<td>6</td>
<td>Soil Organic Matter</td>
<td>• Lecture &lt;br&gt; • Lecture Synopsis &lt;br&gt; • SOM HW &lt;br&gt; • Student directed discussion board &lt;br&gt; • Site Specific blog &lt;br&gt; • Quiz</td>
<td>Chapter 10 pp. 135-138</td>
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<td>7</td>
<td>Soil Food Webs</td>
<td>• Lecture Synopsis &lt;br&gt; • Student directed discussion board &lt;br&gt; • Site Specific blog &lt;br&gt; • Quiz</td>
<td>Chapter 12</td>
</tr>
<tr>
<td>8</td>
<td>Spring Break – Documentary on Dirt!</td>
<td>• Dirt Worksheet &lt;br&gt; • Streaming video</td>
<td>Streaming video</td>
</tr>
<tr>
<td>9</td>
<td>Above Ground – Below Ground Interactions</td>
<td>• Student directed discussion board &lt;br&gt; • Site Specific blog &lt;br&gt; • Quiz</td>
<td>Chapter 12</td>
</tr>
<tr>
<td>10</td>
<td>The Colloidal Fraction</td>
<td>• Lecture Synopsis &lt;br&gt; • Student directed discussion board &lt;br&gt; • Site Specific blog &lt;br&gt; • Quiz</td>
<td>Chapter 5 p. 66</td>
</tr>
<tr>
<td>11</td>
<td>Nutrient Cycles and Soil Fertility</td>
<td>• Lecture Synopsis &lt;br&gt; • Student directed discussion</td>
<td>Chapter 10 and 11</td>
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</tbody>
</table>
Directions for Students

Next Steps: Carefully review the remaining sections of the syllabus section of this course before beginning Week 1 activities, which are located in the Lessons folder in your online classroom.

- Once you feel that you are ready to dive into the first week’s activities, click on the Lessons button on the left-side navigation. Then, click on Module 1 and begin with the Introduction and Objectives.

What To Expect in this Course

This course is 14 weeks in length and includes individual and whole group activities in a weekly cycle of instruction. Each week begins on a Monday and ends on the following Sunday. Please review the course syllabus thoroughly to learn about specific course outcomes and requirements.

This course does have a specific analytical component where students will need to send a soil sample off to an analytical lab (suggestions provided on Blackboard) to obtain biogeochemical results for
interpretation. Costs vary from 15-50 dollars depending on the lab chosen and your local soils.

Each week, you will complete readings that may include videos, multimedia presentations, web-based resources, and articles from professional journals. A reading may be integrated within an activity during the week or provide some key information to assist your learning.

In this course, you will also experience online learning activities, which include discussion boards, virtual simulations, group work, and online multimedia presentations.

Section 4
Assessments and Grading Policy

Assignments
Each assignment will be assigned a numerical value out of 10 or 20 points. Your final grade is calculated as a weighted average of the total number of points (see below for details). Assignments will be detailed in Blackboard.

Some Helpful References
Soil-specific scientific journals (will be useful for your research projects)

Agricultural Systems
Applied Soil Ecology
Biology and Fertility of Soils
Canadian Journal of Soil Science
Communications in Soil Science and Plant Analysis
Journal of Soil Science
Mycorrhiza
Plant and Soil
Soil Biology and Biochemistry
Soil Science Society of America Journal

Scientific journals that are not soil-specific, but which publish papers about soils

Canadian Journal of Botany
Canadian Journal of Forest Research
Ecological Applications
Ecological Monographs
Ecology
FEMS Microbial Ecology
Forest Science
Frontiers in Ecology and the Environment
Journal of Applied Ecology
Microbial Ecology
Microbols
Natural Areas Journal
Nature
Oecologia
Restoration Ecology
Ecological Restoration
Science
Trends in Ecology and the Environment

Fun soil websites

USDA soil surveys on the web:
   http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm
Biological Soil Crusts: http://www.soilcrust.org/
Microbe World: http://www.microbeworld.org/mlc/
Microbe Zoo: http://commetechlep.msu.edu/sites/dlc-me/zoo/
General microbiology: http://www.microbes.info/
Fungi: http://www.wisc.edu/botany/fungi/volkmyco.html
More fungi: http://botit.botany.wisc.edu/toms_fungi/
Mycorrhiza Information Exchange: http://mycorrhiza.ag.utk.edu/
Tree of Life phylogenies: http://phylogeny.arizona.edu/tree/phylogeny.html
Collembola and springtails: http://www.ams.rdg.ac.uk/zooology/hopkin/
Nematodes: http://nematode.unl.edu/Wormhome.htm
USDA Soil Biology Primer:
Various soil ecology images and videos:
http://www.agron.iastate.edu/~loynachan/mov/

Grading

Your cumulative (running) average will be based on the following categories and as a percent of the total allowable points. The total number of points depends in part on the number of students (blogs and discussions) that are in the course. Below are approximates.

| Module Quizzes | 110 Pts |
Online Course Syllabus

Advanced Academic Programs Krieger School of Arts and Sciences
Johns Hopkins University

<table>
<thead>
<tr>
<th>Site Specific Blog</th>
<th>120 Pts</th>
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<tbody>
<tr>
<td>Discussion Activities</td>
<td>130 Pts</td>
</tr>
<tr>
<td>Assignments (concept maps, USEL, etc)</td>
<td>90 Pts</td>
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<tr>
<td>Peer Lead Discussion of Policy Paper</td>
<td>50 Pts</td>
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<tr>
<td>Final Assignment (Revised Concept Map)</td>
<td>25 Pts</td>
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<tr>
<td>Final Paper on Site Soils and Testing</td>
<td>25 Pts</td>
</tr>
</tbody>
</table>

The grading scale for students enrolled for credit is A+ (98-100%), A (94 to <98%), A- (90 to <94%), B+ (88 to <90%), B (84 to <88%), B- (80 to <84%), C (70 to <80%), and F (<70%).

*Late work will receive zero credit and extra credit is not used in this course.

Assignment Guidelines

How should assignments be submitted?

The weekly directions will indicate where assignments will be posted (e.g. in assignment tool within the Lessons folder). If submitting documents to an assignment or forum, please specify the assignment name in the discussion thread and/or the document title. When creating files, include your name and the name of the assignment in the file title. Also, please be sure to only include one period in file names. The period should be between the file name and the extension. For example: jburgess_assignment1.doc

When will assignments be due?

Assignment and activity due dates are listed in this syllabus and the weekly checklists. Assignment due dates can also be found within the Assignment Guidelines area of your online classroom. The instructor via an announcement in the online classroom will announce changes. Some larger assignments will be completed over several weeks. In these cases, you will be prompted to complete portions of the assignment each week.

When will completed assignments be returned?

The instructor will aim to return assignments to you within 5-7 days following the due date, depending on the length of the assignment. You will receive feedback under the My Grades link on the left hand menu of
your course.

**What is the policy for late assignments?**

You are expected to contact your instructor in advance if you think you cannot meet an assignment deadline. However, if an assignment is late and prior arrangements have not been made with the instructor, the assignment score will be zero.

**Time Management Expectations**

What is the time demand and schedule of the course?

Because this is a graduate-level course that is offered in a condensed format, the rigor and time commitment is higher than a traditional 14-week semester course. It is expected that you look ahead to schedule your time. Plan to complete coursework across several days of the week rather than all in one day. Be sure to consider how group activities impact your schedule as well.

Some assignments require that you work on them for multiple weeks. Be sure to review the assignment directions at the beginning of the course so that you can plan your time accordingly. Please seek help before becoming frustrated and spending a significant amount of time to resolve an issue.
Section 5
Course Participation & Communication Policy

Participation

What are the participation requirements?
You are expected to log into the online classroom at least three times a week, though a daily check-in is recommended. It is your responsibility to read all announcements and discussion postings within your assigned forums. You should revisit the discussion multiple times over the week to contribute to the dialogue. During those Modules where threaded discussions are assigned, I will facilitate student discussions but I will not address every single post. In most cases, I might share a related idea, intervene when the discussion goes off-track, or tie student comments together to help deepen student learning. Consequently, I will not directly answer questions in the discussion area unless they are addressed to me. I will check the discussions daily during the week, and occasionally on the weekends.

Network Etiquette (i.e. “Netiquette”)
In this course, online discussion will be primarily take place in our online discussion board. In all textual online communication it’s important to follow proper rules of netiquette.

What is netiquette? Simply stated, it is network etiquette -- that is, the etiquette of cyberspace. And "etiquette" means the social and cultural norms of communicating with others in a proper and respectful way. In other words, netiquette is a set of rules for behaving and interacting properly online.

The Netiquette “Core Rules” linked below are a set of general guidelines for cyberspace behavior. They probably won't cover all situations, but they should give you some basic principles to use in communicating online.

For Netiquette Core Rules visit The Core Rules of Netiquette web page.

Contacting the Instructor
The instructor for this course is J.L. Burgess (jerry.burgess@jhu.edu).
Feel free to contact me with comments, questions, and concerns. You will receive a response within 24-48 hours.

All email messages will be sent to you via your JHU email account, so you should be in the habit of checking that account every day or you should ensure that your JHU email account forwards messages to another account of your choice.

Professionalism is expected throughout this course whether in the online classroom or email. Your responses to questions, interaction/communications/emails with classmates or me should be professional in manner. This includes "netiquette" (electronic etiquette) such as using salutations (not "Hey!") when you send an email, signing your emails, and responding to emails in a timely fashion.
Section 6
Course Protocols & Getting Help

Course Protocols

How will I know about changes to the course?
Frequently, you will find new announcements posted in the Announcements, which contain information about current course activities that you are working on and any changes to the course. Please check announcements every time that you log into the Bb.

How should I communicate with others in this course?
You should communicate often with your classmates and with your instructor. The majority of communication will take place within the Discussion forums. When you have a question about an assignment or a question about the course, please contact your instructor, or post your question in the course’s “Syllabus & Assignment Question” forum.

Are there any requirements for sending e-mail messages?
When you send an e-mail message to the instructor or to another participant in the course, please observe the following guidelines:
● Include the title of the course in the subject field (e.g., JHU Soils in Natural and Anthropogenic Environments).
● Keep messages concise, and check spelling and grammar.
● Send longer messages as attachments.
● Sign your full name (the sender’s email is not always obvious).

Getting Help

You have a variety of methods to get help on Blackboard. Please consult the help resources listed in the online classroom for additional information.

Important Note: If you encounter technical difficulty in completing or submitting any online assessment, immediately contact the 24-hour Help Desk. Also, contact your instructor at the email address listed atop this syllabus.
University Policies

General
This course adheres to all University policies described in the academic catalog. Please pay close attention to the following policies:

Students with Disabilities
Johns Hopkins University is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact the coordinator listed on the Disability Accommodations page. Further information and a link to the Student Request for Accommodation form can also be found on the Disability Accommodations page.

Ethics & Plagiarism
JHU Ethics Statement: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor. Read and adhere to JHU's Notice on Plagiarism.

Dropping the Course
You are responsible for understanding the university’s policies and procedures regarding withdrawing from courses found in the current catalog. You should be aware of the current deadlines according to the Academic Calendar.

Getting Help
You have a variety of methods to get help. Please consult the help listed in the "Blackboard Help" link in the online classroom for important information. If you encounter technical difficulty in completing or submitting any online assessment, please immediately contact the designated help desk listed on the AAP online support page. Also, contact your instructor at the email address listed atop this syllabus.

Copyright Policy
All course material are the property of JHU and are to be used for the student's individual academic purpose only. Any dissemination, copying, reproducing, modification, displaying, or transmitting of any course material content for any other purpose is prohibited, will be considered misconduct under the JHU Copyright Compliance Policy, and may be cause for disciplinary action. In addition, encouraging academic dishonesty or cheating by distributing information about course materials or assignments which would give an unfair advantage to others may violate AAP’s Code of Conduct and the University's Student Conduct Code. Specifically, recordings, course materials, and lecture notes may not be exchanged or distributed for commercial purposes, for compensation, or for any purpose other than use by students enrolled in the class. Other distributions of such materials by students may be deemed to violate the above University policies and be subject to disciplinary action.

Code of Conduct
To better support all students, the Johns Hopkins University non-academic Student Conduct Code has been integrated and updated to include all divisions of the University. In addition, it is important to note that all AAP students are still accountable for the Code of Conduct for Advanced Academic Programs.
Title IX

Confidentiality and Mandatory Reporting
As an instructor, one of my responsibilities is to help create a safe and inclusive learning environment on our campus. I also have mandatory reporting responsibilities related to my role as a Responsible Employee under the Sexual Misconduct Policy & Procedures (which prohibits sexual harassment, sexual assault, relationship violence and stalking), as well as the General Anti-Harassment Policy (which prohibits all types of protected status based discrimination and harassment). It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in our one-on-one meetings. I will seek to keep information you share private to the greatest extent possible. However, I am required to share information that I learn of regarding sexual misconduct, as well as protected status based harassment and discrimination, with the Office of Institutional Equity (OIE). For a list of individuals/offices who can speak with you confidentially, please see Appendix B of the JHU Sexual Misconduct Policies and Laws.

For more information on both policies mentioned above, please see: JHU Relevant Policies, Codes, Statements and Principles. Please also note that certain faculty and other University community members also have a duty as a designated Campus Safety Authority under the Clery Act to notify campus security of certain crimes, as well as a duty under State law and University policy to report suspected child abuse and/or neglect.