

UMCES Course Guidelines

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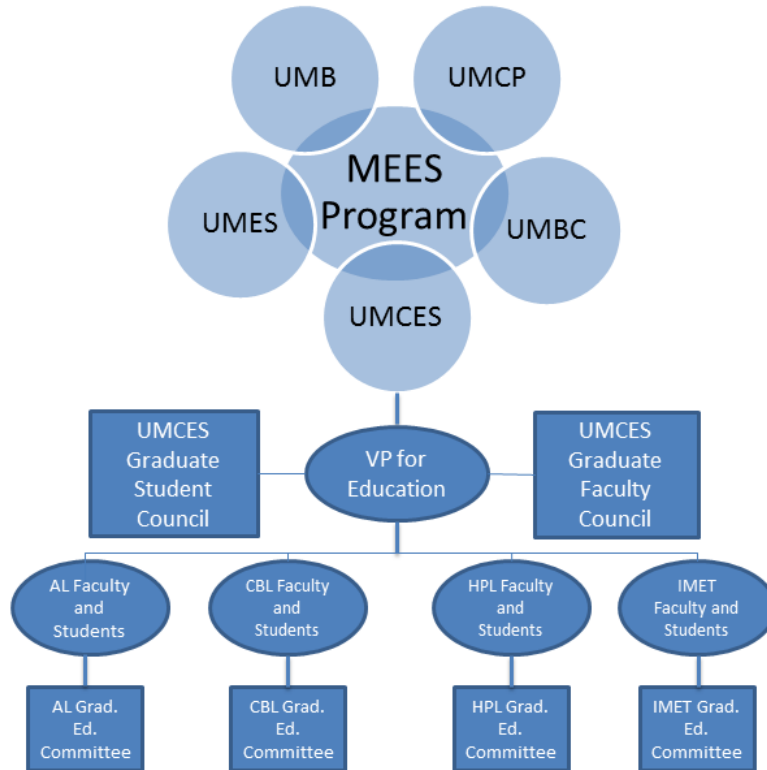
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I. MEES-UMCES Relationship

The MEES Program is a multi-institutional graduate program in the University System of Maryland. Students in the program may study for M.S. and Ph.D. degrees. The diverse interests of students in the program generally focus broadly on environmental sciences and on interactions between biological, physical, chemical, and social systems. In UMCES, MEES students conduct thesis research on ecosystems ranging from the mountains to the sea. Research topics range from study of molecular mechanisms to economic assessments of environmental impacts. To ensure that students in the program appreciate the scope of environmental sciences, each student is required to take courses in professional development in addition to focused coursework in foundation areas related to their particular interests. Courses taken by MEES students are taught at five institutions within the USM. All MEES courses are available to graduate students registered at any of the five MEES institutions. UMCES has a major investment in MEES and most UMCES graduate students are enrolled in the MEES Program. Most MEES courses are taught via synchronous online instruction, precluding the need for students to travel to off-campus sites. In most cases, UMCES students in the MEES Program conduct their research at the Laboratory where their faculty advisor resides.

MEES-UMCES Relationships



- MEES Course Catalog: http://www.umces.edu/sites/default/files/Course%20Catalog_8july2022.pdf
- MEES Course Syllabi: <https://www.umces.edu/mees-course-syllabi>

II. UMCES Programs, Curricula, and Courses Committee (UMCES PCC)

To assist faculty in developing courses, to avoid any overlap, redundancies, or gaps in student learning, and to make sure an appropriate rotation of courses is offered, UMCES has formed the UMCES Programs, Curricula, and Courses Committee (UMCES PCC). The UMCES PCC approves courses and the UMCES Vice President for Education (UMCES VPE) office schedules (in co-ordination with the MEES office) all UMCES course offerings. The UMCES PCC is drawn from membership of the UMCES Graduate Faculty Council, with the possible exception of the Chair and Student Representative and additional members if all foundation areas are not represented. UMCES PCC membership cuts across all laboratories and foundation areas in which we offer courses.

III. Overview of Course Submission and Course Policies

All UMCES faculty must contact the UMCES PCC before offering any MEES course (new or existing). The UMCES PCC will review submitted course proposals and will work with the faculty member(s) to prepare for course submission to the UMCES VPE and MEES offices. To help with this process, this faculty

guidance document outlines the deadlines, policies and procedures governing UMCES MEES course offerings.

For courses to appear on the USM schedule of classes (<https://app.testudo.umd.edu/soc/>) in a timely manner, a series of deadlines need to be met at the UMCES VPE office, the MEES office, and UMCP. Course offerings should be appropriate for the MEES curriculum, fulfilling the needs of our UMCES students in their diverse research fields with an appropriate number of credits and at the correct course levels. The MEES curriculum has four categories of required courses: foundations, professional development, electives and issue study groups, all described in more detail below. This document provides guidance and criteria for each of these course categories. Faculty may also offer one-credit traditional reading/discussion seminar classes, which will count as an elective credit.

Foundation courses are permanent, regularly offered (every Fall) courses. Similarly, most of the professional development courses should also be permanent course offerings, regularly taught by faculty (individuals, teams or rotating teams of faculty). Electives should also be designed as a potential permanent course offering; they may be initially assigned a temporary MEES course number, but after the second time they are offered they should request a permanent course number. Issue study groups and seminars address topical issues and are usually one-time offerings, so will be assigned a temporary course number. Guidelines for MEES course numbering are described in section 2.3 below.

Deadlines for course submission

All instructors must notify the UMCES PCC if they plan to offer an upcoming course, in compliance with the deadlines for Fall and Spring courses below. This notification should include courses with no substantive changes, courses with changes and proposed new course offerings. If there are no substantive changes to a course, only an [Intent to Teach Form](#) is needed. If there are modifications to a course, instructors should submit both the [Intent to Teach Form](#) and an updated [Syllabus Template Form](#). Faculty members proposing new courses should submit an [Intent to Teach Form](#), an [UMCES New Course Proposal Form](#), and a draft course syllabus (using the [Syllabus Template Form](#)). For new courses the syllabus form should contain sufficient information for the UMCES PCC to be able to review the course proposed. These materials should be submitted via email to the UMCES PCC at umcespcc@umces.edu. Blank versions of all three forms, together with examples from previous courses and other curriculum materials, can be found in the [faculty curriculum repository](#) shared drive.

All course materials must be submitted to the UMCES PCC by **December 1st of the present year for the next year's fall semester** and by **May 1st of the present year for the following year's spring semester**; i.e., approximately 9 months in advance. Course materials not submitted by these deadlines will not be considered for the associated semester, with limited exceptions. An email from the UMCES VPE office will be sent out a few weeks in advance to remind faculty about submission dates together with a list of courses for that semester based on previous year's offerings. **All faculty who plan to teach that semester need to respond.**

Modified course syllabi and new course syllabi will be reviewed by the UMCES PCC, which will provide feedback and suggestions (if any) to the instructors. The instructors will need to provide a final revised syllabus to the UMCES PCC in a timely manner. The UMCES PCC will then compile the final list of UMCES courses for the semester and forward it to the UMCES VPE and MEES offices for further approval (if necessary) and scheduling. The UMCES VPE office is responsible for scheduling of accepted UMCES

offerings (see section 3) in collaboration with the MEES office. Once approved, courses will be listed on the UMCP schedule of classes at <https://app.testudo.umd.edu/soc/>.

The only potential exceptions to the above course submission deadlines are for Issue Study Groups or seminars that respond to current events or are highly topical, or for new faculty hires, at the discretion of the UMCES PCC/UMCES VPE. These should be submitted as early as possible for favorable consideration.

Course Types

In the MEES curriculum (MC) there are four types of courses: Foundation courses, Professional Development (PD) courses, Issue Study Groups (ISGs), and Electives. Details for each category are provided below. Note that some courses may be included in more than one course type. For example, a course might be considered an elective or a professional development course (e.g. Advanced Statistics). However, a course can fulfill only one course requirement at a time for a student's course of study; e.g., an ISG focused on a professional development topic might be considered an ISG or a PD course, but not both.

Foundation Courses

The Foundation courses are permanent 3 credit course listings offered every Fall semester. The Foundation courses are designed to provide broad foundational training in the Environmental Sciences and provide context for subsequent courses and research. They are also meant to provide basic prerequisite knowledge for more advanced courses. There are four Foundation courses, one for each Foundational area, as follows:

1. Environment and Society: MEES 620 Environment and Society.
2. Earth and Ocean Sciences: MEES 640 Interconnected Earth Systems: Land, Ocean, and Estuary.
3. Ecological systems: MEES 660 Ecological Systems.
4. Environmental Molecular Science and Technology: MEES 680 Cell and Molecular Biology for the Environmental Scientist - from Genes to Ecosystems.

Each MEES student is required to take at least one Foundation course for credit. A second Foundation course may be taken but would count as an elective. Foundational courses are usually team-taught, often with faculty from different UMCES laboratories or MEES partner institutions.

Professional Development Courses (PD)

PD courses are designed to provide training that cuts across disciplines to provide graduate students with essential professional skills. These are not specific to any foundation area. They may include courses in responsible conduct of research, ethics, scientific writing, communication, data visualization, statistics, quantitative analysis, career planning, etc. PD courses may be offered for 1-3 credits and are intended as permanent and regularly scheduled courses offered in either the Spring or Fall semester, either annually or every other year. These courses are often team-taught with faculty from multiple UMCES laboratories or MEES partner institutions.

All incoming MEES students are required to take the PD course “MEES601 Applied Environmental Science”, preferably in their **first Spring semester** immediately after taking their primary Foundation course in the Fall. The goal of this course is to bring the cohort of new MEES students together to work on applied interdisciplinary problems with teams of students representing all foundational areas and laboratories.

All MEES students also are required to take two additional PD courses. Advisors/committees may recommend that their students take a responsible conduct of research class as a PD course, which will fulfill some funding agencies’ requirement to do so (e.g. National Science Foundation, National Institutes of Health). Students should work with their advisors/committees to determine the best PD courses for their individual programs. PD courses beyond the 3 required may be considered electives.

Issue Study Groups (ISGs)

Issue Study Groups are courses that focus on current issues in environmental science and/or policy. ISGs may involve reading, discussion, and synthesis of literature, or they may require accessing, analyzing and synthesizing primary material or data. Issue Study Groups collaboratively research, discuss, and synthesize information on the chosen topic, culminating in public communication pieces such as white papers, manuscripts, presentations, workshops, or other innovative communication products. All MEES students are required to complete one Issue Study Group course during their program of study. ISGs are usually 2-credit courses taught in a single semester, but they may also be taught over 2 semesters for 1 credit each semester. ISGs are not intended for students in their first semester, ideally ISGs should be taken after completing the MEES601 Applied Environmental Science course.

Electives

Half or more of a student’s coursework in the MEES program should comprise elective courses. Electives are courses intended to follow on from Foundation courses (though they are not officially assigned to a specific Foundation) and are intended to provide in-depth training in specific intellectual fields of study. Elective courses are offered to provide concepts and tools that are required for a student to more fully understand and complete their research. Elective courses should be offered on a regular basis, either every year or in alternate years in either the Fall or Spring semesters. Temporary special topics electives may be offered occasionally (see below for more details). If a course is not a Foundation, PD, or ISG then it is an elective by default. Foundations, PD courses, and ISGs beyond the minimum required may be considered as electives. Graduate courses from outside of MEES may also be taken as electives with the approval of a student’s advisory committee. The MEES Program Foundation subcommittees are currently working on compiling lists of relevant non-MEES courses.

Students should work closely with their advisors and committee members to discuss the appropriate electives to take, with consideration as to when specific courses are scheduled to be offered, particularly for courses offered only once every two years. Elective courses may have prerequisites if appropriate, including Foundation or PD courses. Faculty should describe prerequisites for their course in the course syllabus. Advanced electives that require pre-requisites at or above the 600 level may be offered at the 700 level.

Most electives should be for 2-3 credits, but if an elective also contains field work or laboratory work (including computer laboratory time), then faculty may request as many as 4 credits. All 4 credit requests must provide justification as to why the extra credit is required.

Seminars

Traditional reading/discussion graduate seminar courses are not required in the MEES curriculum. However, these course types are still available, often on an ad hoc basis and usually covering a current topic of interest or advanced knowledge for specific groups of students. Seminars differ from Issue Study Groups primarily because seminars do not require an organized final product. MEES seminar courses are designated as MEES608* (* represents a letter specific to each seminar) for 1 credit. In Testudo these are called 'Seminars in MEES:' followed by the specific seminar title. A 1-credit traditional reading/discussion seminar is considered an elective.

MEES 699 Directed Research

Independent study on specialized topics under the direction of individual faculty members. This course should be treated no differently than any other new course proposal. It should also be offered for 1-3 credits and be available to all MEES students via a virtual platform. To request a MEES 699 class all of the required UMCES PCC forms should be completed and submitted to the UMCES PCC (UMCESPCC@umces.edu). This should include the new course form, including a justification of course credits, the syllabus template, and the intent to teach form. Ideally these requests should be made at the same time as other course deadlines, i.e. May and December 1st, however, exceptions past these deadlines can be made in exceptional circumstances.

Course credits and numbering

Credit hours must be assigned to courses in a way that is consistent across the MEES program. As a guide, one credit is equivalent to one contact hour of classroom time or direct faculty instruction for approximately fifteen hours over a semester. For winter or summer courses, credits are assigned using the shortened available time period, e.g. a 1-credit course in 3 weeks would require 5 contact hours per week. For laboratory and field instruction 2 contact hours are required per credit hour. Although not an official rule, as a rough guide a credit should require approximately 2-3 hours of out-of-class student work per week.

UMCES/MEES courses fall into 4 categories, with two subcategories for electives. In the following list, note that * represents a letter specific to each course for shared temporary course numbers.

1. Foundation courses (600 level) are offered in the Fall semester for 3 credits.
2. Professional Development courses are offered at any time for 1-3 credits. New temporary PD courses are designated as MEES609* and permanent PD courses are assigned numbers MEES601-619, or for more advanced PD courses MEES701-719. Existing PD courses with numbers that do not follow this numbering scheme will be transitioned into it when possible.

3. Issue Study Groups may be offered at any time, but the PCC's goals are to schedule 2 ISGs per semester and to ensure disciplinary breadth over a 2-year rotation. ISGs are usually listed at the 700 level and designated MEES718*, but they may be listed at the 600 level as MEES618*.
4. Electives (600-700 level) may be offered at any time for 2-4 credits (4 credits only with a significant lab or field component). Most electives are offered every year or every other year, based on a regular 2-year rotation and typical student demand. Permanent course numbers are assigned in the 20 number range starting with the most closely associated foundation course (see section 2.2.1 above). Temporary elective courses are generally numbered as MEES498*, MEES698* or MEES708*.
5. Traditional reading/discussion seminars may be offered as a 1-credit elective courses at any time. Seminars are designated as MEES608* and advanced seminars as MEES708*.

600-level courses may also be cross-listed as 400-level (upper-level undergraduate) courses to increase participation, providing strict guidelines are provided to define different expectations from students at the different levels. Faculty must submit a separate syllabus for both the 400-level and 600-level of the same course. A 700-level course is an advanced course that usually requires a 600-level prerequisite (e.g. a Foundation course, a PD course or 600-level elective). Careful consideration should be given to the level of the material in the course, keeping in mind that many MEES courses are cross-listed in other schools or departments and so may be more appropriate at the 600-level rather than the 700-level.

Course Lifecycle

Proposing a New Course

Faculty members seeking to propose a new course are encouraged to discuss their proposal with other colleagues in similar disciplines. Additionally, refer to the spreadsheet and course catalog(s) in the [faculty curriculum repository](#) to identify if there are current course offerings of a similar nature. After discussion, faculty members should fill out an [Intent to Teach form](#), a [New Course Proposal form](#), and a draft course syllabus (using the [Syllabus Template form](#)) and turn them in to the UMCES PCC by the proper submission deadline. Justification of how the proposed course fits into the overall program curriculum, including coordination with other courses and the specific need for the proposed course, must be provided in the New Course Proposal. Please consider team-teaching courses with your colleagues and reducing overlap and redundancy between courses. Currently, we have more MEES courses (especially electives) than are sustainable given the number of graduate students enrolled in MEES plus students from other Institutions and programs who may take our courses. Also please check other courses that may be available in non MEES programs.

Temporary and Permanent Courses

All new courses automatically receive a temporary course number reflecting the type and level of course. Once a temporary course has been offered two times, the course will transition to a permanent number. Permanent numbers are assigned to courses based on a [numbering scheme](#) (see section 2.3) that considers type of course and whether the course is 600 or 700-level material.

If a course has a permanent number, it must be taught on a regular schedule. If a faculty member is temporarily unable to teach his or her regularly offered course, it is the responsibility of that faculty member to find an alternate instructor for that semester.

Changes to a Permanent Course

If a faculty member wishes to change the title, content, timing or credits of a permanent course, then the UMCES PCC must be contacted with the requested changes. A new, temporary course number will be assigned to the course. Approvals must be made at both the UMCES PCC level and at the level of the UMCP Graduate School.

Course Cancellation Procedures

No course may be canceled within 60 days of its scheduled start date. If significant problems arise within this time frame, please contact the UMCES VPE Office immediately. The Foundation courses and Applied Environmental Science are required courses, and therefore cannot be canceled.

To cancel a course:

- 1.** Classes should be taught for at least one week at the start of the semester. If at the end of the first week there are five or more students, the course must be offered for the rest of the semester.
- 2.** If enrollment is below five at the first course meeting, the instructor and students should discuss the possibility of cancellation. Students should be encouraged to investigate potential alternative courses in case cancellation becomes necessary. The UMCES VPE Office should be notified of the low enrollment as well.
 - Normally, a course that remains under-enrolled (less than 5 students) after the first week of classes is canceled.
 - If an under-enrolled course is essential for some students and will not be offered again in time to meet their needs, it may continue to be taught or other options may be pursued.
 - Under-enrolled courses may continue to be taught with the approval of the relevant Lab Director(s).
 - Please keep in mind that the first week of classes is very flexible and Testudo is not always an accurate indication of student enrollment. Actual classroom attendance and directly communicated student interest are more reliable.
- 3.** If a course needs to be canceled after the first week of classes:
 - Send an email to the UMCES VPE Office, MEES, and your lab director notifying all offices of the cancellation.
 - Please notify the student(s) currently enrolled in the course not to drop the course on their own and wait to be automatically dropped from the course once the cancellation has been processed. This way, they will not receive a drop penalty.

Undersubscribed Courses and Course Terminations

The MEES Office typically waits two weeks to make final decisions about canceling low enrollment (less than five students) classes. The MEES director makes the final decision after reviewing the information and consulting with the instructor(s) as needed and informs the instructor of the decision. The wait time is necessary because occasionally students have enrollment issues or are still adding and/or dropping courses. If your course contains fewer than 5 students, you may petition for course continuation at the discretion of your Laboratory Director.

If a course is canceled twice in a row due to low enrollment, the course will be discussed by the UMCES PCC in consultation with the instructor(s) and may be removed from the regular course rotation, or possibly offered less often.

If a faculty member wishes to no longer teach a course, they must immediately contact the UMCES PCC to discuss potential options. If you are responsible for a course and leave UMCES please also notify the UMCES PCC so that alternate arrangements (if needed) can be made.

IV. Course Scheduling (UMCES VPE Office)

UMCES courses are scheduled by the UMCES VPE office working with the MEES office. Scheduling balances 1) aligning class start or end times with the standard USM class schedule, 2) instructor preferences, and 3) minimizing year-to-year changes. Alignment with the standard USM schedule is especially important if a course is expected to attract students from other campuses. Please note on the Intent to Teach form if you anticipate enrollment from other campuses.

The standard USM class schedule offers classes between 8am and 6:30pm, in 90 min blocks on Tuesdays and Thursdays (Tu/Th) and in 1-hour blocks on Mondays, Wednesdays, and Fridays (MWF). Alternate 90 min blocks are available (though not encouraged) on MW starting at 8am. Most UMCES courses are 3 credits offered in two 90 min blocks on either MW or Tu/Th. See Table 1 for the Standard USM schedule. All classes should end 10 min before the nominal block end time to allow for class transitions, such that a 90 min block allows for 80 min of class time and a 1-hour block allows for 50 min of class time.

Faculty will be notified of the draft dates and times that their classes are scheduled. Ideally, foundation and permanent course offerings will maintain constant day and time slots, however, this may not always be possible given year-specific scheduling conflicts. After any conflicts have been resolved, the UMCES VPE office forwards the UMCES class schedule to the MEES office.

Table 1 - Standard USM class schedule

MWF 1-hour classes	MW 90 min classes	TuTh 90 min classes
MWF 8:00am	MW 8:00am	TuTh 8:00am
MWF 9:00am	MW 9:30am	TuTh 9:30am
MWF 10:00am	MW 11:00am	TuTh 11:00am
MWF 11:00am	MW 12:30pm	TuTh 12:30pm
MWF 12:00pm	MW 2:00pm	TuTh 2:00pm

MWF 1:00pm	MW 3:30pm	TuTh 3:30pm
MWF 2:00pm	MW 5:00pm	TuTh 5:00pm
MWF 3:00pm		
MWF 4:00pm		
MWF 5:00pm		

Video classroom scheduling

The scheduling of specific video classrooms is carried out by administrative staff at each of the UMCES sites. As there are a variety of potential video classrooms available at each site, it is important to note any room or IT specific requirements needed for your course on the **Intent to teach form**.

V. Course Syllabi, Timeline, and Grades

The course syllabus is an important course component to relay course policies, procedures, deadlines, learning outcomes, and assessments to students. Course syllabi using the template provided must be sent to the UMCES PCC (blank templates and example course templates can be found on the [UMCES faculty curriculum repository](#)). Please note: if you are requesting a 4-credit elective course you will need to provide justification as to why the extra credit is required (i.e. additional activities above and beyond normal classroom lecture instruction). Any prerequisites for a course must be clearly specified in the course syllabus and/or any requirement for ‘permission of the instructor’, etc.

Scheduling Final Projects and Exams

No classes or associated regular course assignments should be scheduled after the official last day of classes. In addition, no assignments or other class activities should be assigned or due on the “reading day,” which occurs once per semester after the last day of classes, but prior to the allotted time for finals. See the UMD academic calendar for these dates. Any activity or assignment that is considered all or part of the final exam should be due or conducted during finals week.

Final exams and/or final projects traditionally are scheduled on a course-by-course at UMCES. Please discuss your proposed final exam, including format and schedule, with your students early in the semester and in the syllabus in case there are any major conflicts or excessive burdens that we might be able to resolve by a bit of rescheduling.

Please be aware that if you have a course that is cross-listed as a 400-level, upper-level undergraduate course, you want to take into account the [UMD final exam schedule](#) for undergraduates.

Submitting Grades

Final grades should be submitted in a timely manner on [UMEG](#), the university’s electronic gradebook software.

Procedures for Uploading Your Syllabus to Testudo

1. Detailed instructions for using the syllabi repository [are available here](#), but briefly, it works as follows: There are currently two components of the repository with a third component envisioned for the future for students to be able to search for syllabi across the repository.
2. Upload syllabi into the repository by visiting the [ELMS Management Tool](#) (also available from [elms.umd.edu](#) and clicking on link at left). Select "Publish Course Syllabus" on the left, select a term and course, and then upload a syllabus PDF file with the "Select Syllabus" button on the right.

VI. Course Learning Management Systems

UMCES uses Moodle as their primary learning management system where course information and material is kept. Students who do not have Moodle accounts will have an account created automatically for them with their umces.edu email address as their username and an initial password the instructors will receive when the additions are complete. Students who already have Moodle accounts will be added to their courses and may log in with their umces.edu email address as the username along with their previous password. For questions or assistance, please contact moodle-feedback@umces.edu.

VII. Zoom

The primary platform used for online meetings and classes is Zoom. Zoom is a web-based application enabling faculty, staff, and students to host meetings, webinars, and conference calls remotely. UMCES has a number of Zoom login credentials for use. Please contact your lab's assistant director or IT group for more information on your lab's credentials. Each semester, Zoom links will be created and circulated to all teaching faculty, but Zoom links should only be distributed to those registered or interested in registered for your course(s).

To download Zoom for your desktop, laptop, or mobile device, please see the Zoom website: <https://zoom.us/download>

UMCES IT has identified the following minimum requirements for a successful Zoom connection: An internet connection that is at least broadband wired or wireless (3G or 4G/LTE). Minimum bandwidth is 600kbps (up/down) and recommended is 1.5 Mbps (up/down). Check your Internet bandwidth using Speed Test: <https://www.speedtest.net/>

VIII. Course Learning Outcomes and Assessment

Learning Outcomes Overview

As a student progresses through their course of study at UMCES, we expect our students to be competent with several specific skills at the conclusion of their graduate degree, we call those our *programmatic learning outcomes*. Learning outcomes are simply the desired competencies we expect of our students at the end of a course of study. UMCES courses are designed to teach students a number of these skills and concepts. What we expect our students to be able to do at the end of a course we teach are our *course learning outcomes*. Course learning outcomes feed into program learning outcomes, which feed into the institutional outcomes to help UMCES achieve its educational mission. The **New Course Proposal form** includes a section on how the course fits in with program learning outcomes.

Drafting Course Learning Outcomes

Creating course learning outcomes is part of an increasingly popular standard of teaching practice that is based on the premise that the most effective learning occurs when faculty go through a deliberate and iterative process to explicitly decide what they want to teach, determine how they are going to teach it, assess whether the students have learned, and then iterate back to change the course and improve student outcomes. Drafting effective course learning outcomes is an essential part of this process and is best done first when developing a new course, but can be done at any time for existing courses. Course learning outcomes are the “what you want to teach” part of the process and they are simply statements that describe what a student will be able to do by the end of the course. It is important that course learning outcomes are measurable, so that assessment and subsequent course improvement can be carried out. Explicitly communicating the course learning outcomes to students in a syllabus has the added benefit of helping students know what they should be learning, thereby improving the likelihood that they will indeed learn what is intended.

At their core, learning outcomes are:

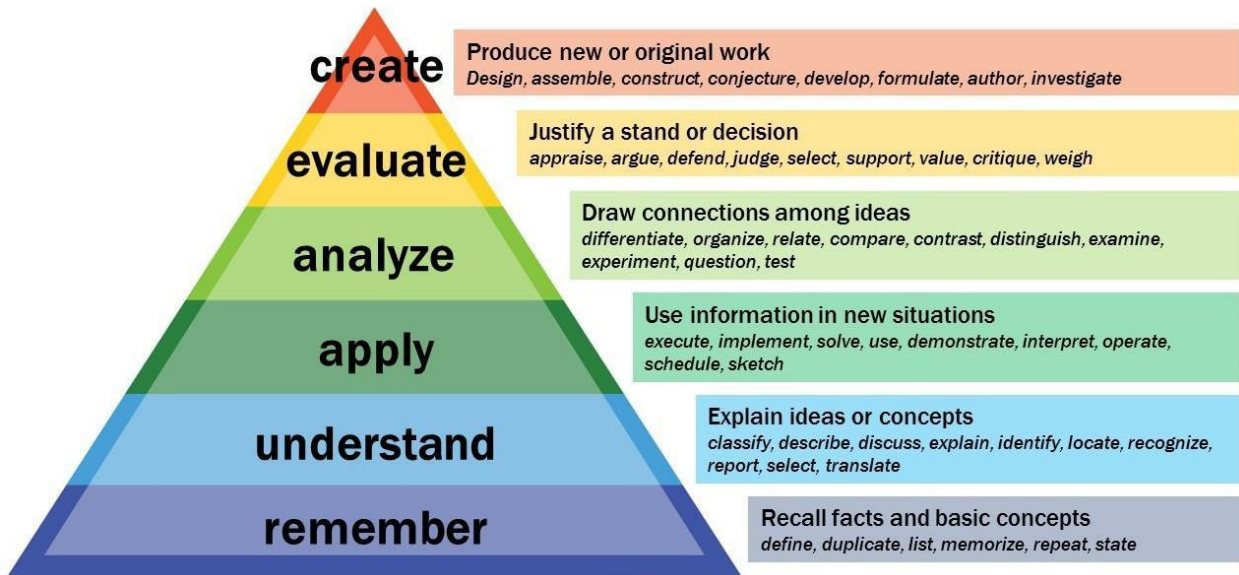
- An action word (see below at Bloom’s Taxonomy for examples of action words)
- Measurable and able to be assessed
- Descriptions of what students should be able to do once they finish your course
- Student-focused rather than instructor focused (i.e. what will the student be able to do at the end rather than what the instructor plans to teach)

We encourage you to look over your current course learning outcomes and adjust them as your course changes over time. All syllabi must include stated learning outcomes.

Bloom’s Taxonomy

Bloom’s Taxonomy is a good resource for writing effective course learning outcomes. The base of the pyramid includes a more foundational understanding of the subject matter or skills. As you move up the pyramid, the verbs used indicate a mastery of the subject or skills.

Bloom's Taxonomy



Vanderbilt University Center for Teaching (2015). [Bloom's Taxonomy](#).

This can be translated into a framework of teaching where students are introduced to a topic (remember, understand), given a chance to reinforce their learning (apply, analyze), and develop mastery (evaluate and create). Like learning outcomes, this sort of framework can be applied to a single class period, to an entire course, or to a program of study at any level.

Example Learning Outcomes

The following are example learning outcomes for a seminar course that used to be taught in MEES called Climate Change and the Biosphere.

1. Explain the significant impact physical environment has on biological systems.
2. Apply important physical concepts and principles to draw conclusions about climate processes.
3. Identify and summarize the important impacts of climate change on systems in their sub-field of environmental science.
4. Effectively communicate knowledge about the significance of current climate-related research in the student's sub-field by writing a research paper

Utilizing Learning Outcomes

Learning outcomes can improve student learning when they are utilized. There are two key parts of this teaching method:

- Reinforcement: giving the students opportunity to develop the skills required in the stated course learning outcomes

- Assessment: giving the students opportunity to demonstrate their skills in some via assessment. This can be a formal assessment such as an exam or written assignment linked to a learning outcome, or it can be informal, such as instructor observation during a class discussion.

For example, let's use the second learning outcome from the above examples: "Apply important physical concepts and principles to draw conclusions about climate processes."

- Reinforcement: After teaching key physical concepts, the instructor could bring up relevant data and spend class time working to understand as a group by applying those key concepts that were just explained.
- Assessment: Later, on an exam, the instructor might have a map or plot of other data that are relevant to the same physical concepts and ask the students to interpret the data in terms of those key concepts. If half the students got the question wrong, the instructor would self-assess how the concepts could be taught differently or give more practice so that more of the students understood the concept better next time.

Thus, the Learning Outcomes, Teaching, and Assessment loop is closed. Instructors can also use learning outcomes in their course design to ensure that what they really want to teach is what they are actually teaching. For example, when developing a course, an instructor decides that she wants her students to be able to use their new knowledge to develop a research proposal idea and be able to write a proposal. However, the current syllabus has new content scheduled for every class period and does not have any time to teach about proposal writing. The instructor decides to carve out time from lecture to give students guidance (introduction) and to let them turn in a draft for a peer review exercise so that they get some practice with proposal writing and reading (reinforcement) before they are expected to turn in a proposal (demonstration of mastery for assessment).

Course Learning Outcomes Assessment Options

While there are countless ways to assess course learning outcomes, below are a few options that are useful and available to instructors:

- Observation of student discussions and interactions, etc. to gauge difficulties or gaps in knowledge (informal assessment)
- Linking assignments or test questions to specific learning outcomes (quantitative assessment).
 - Excel template with directions for use by instructors (utilized by UMCES faculty)
 - Moodle has the capability of linking learning outcomes to assignments, tests, and grades.
 - Canvas has the ability to link learning outcomes to assignments, tests, and grades.
- An end of semester anonymous questionnaire on how well the students feel that the learning outcomes were met (qualitative assessment)

Google Shared Team Drive for faculty curriculum repository:

<https://drive.google.com/drive/u/1/folders/0ACQF6qJIUr6BUk9PVA?ogsrc=32>

If you have any problems accessing the Google drive, please email the UMCES PCC at UMCESPCC@umces.edu