

April 5, 2011

Dean's Office
UNC Charlotte
9201 University City Blvd
Charlotte, NC 28223

Dear Members of the Award Selection Committee,

Please find along with this letter my teaching portfolio for the 2011 College of Engineering Teaching Award. I am honored to be nominated by the Department of Engineering Technology for this award and appreciate the opportunity to submit the attached materials for your review. At all stages of my career, I have sought out opportunities to engage in education including outreach to middle schools, workshops for professionals, invited lectures in courses taught by colleagues here at UNC Charlotte and in my own course development.

My teaching philosophy, which is described in greater detail in the attached teaching statement, centers on problem-based learning and providing students with opportunities to build upon previously learned concepts. I have taught freshmen through doctoral candidates and utilize a range of teaching methods in all my courses. Since joining UNC Charlotte in January 2009, I have developed undergraduate courses in water resources, water treatment and freshman education in the Department of Engineering Technology. I have also team-taught advanced undergraduate and graduate level courses in Civil and Environmental Engineering and Geography and Earth Sciences that bridge engineering and ecology.

I am particularly excited about a new Sustainability initiative that I've been actively working on over the past six months. Together with Dr. Wei-Ning Xiang (Geography and Earth Sciences) and Dr. Helene Hilger (Civil and Environmental Engineering), I submitted a proposal for integrating sustainability into the general curriculum as part of the development of the Quality Enhancement Plan. While this process is still ongoing, as part of this effort I'm developing a new course to be taught Fall 2011, Sustainable Systems (ETGR 3000). The course will focus on sustainability as it applies broadly to engineering analysis, design and implementation. Key topics will include energy, water resources, infrastructure, industrial applications (material selection, disposal, marketing), economics and social justice. Students will learn methods to assess and incorporate sustainability across multiple disciplines and have the opportunity to design a system sustainably through a group project.

The following materials highlight my teaching philosophy and how I have successfully implemented it at UNC Charlotte. Thank you very much for your time and consideration.
Sincerely,



Dr. Sara K. McMillan, P.E.

DR. SARA K. McMILLAN, P.E.
Curriculum Vitae

Department of Engineering Technology, William States Lee College of Engineering
University of North Carolina at Charlotte
9201 University City Blvd, Charlotte, NC 28223
Phone: 704-687-6585; Email: smcmillan@uncc.edu

Education

- 2007 PhD Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill. *Dissertation:* Influence of hydrology and denitrification on nutrient dynamics in coastal headwater streams. *Advisors:* Dr. Hans W. Paerl and Dr. Michael F. Piehler
- 1998 MS Department of Civil and Environmental Engineering, University of Iowa
Thesis: Phytoremediation of methyl *tert*-butyl ether (MTBE) by hybrid poplar trees. *Advisor:* Dr. Jerald Schnoor
- 1997 BSCE Department of Civil and Environmental Engineering, University of Iowa

Professional Positions

- 2009 – present *Assistant Professor*, Department of Engineering Technology, University of North Carolina at Charlotte, Charlotte, NC
- 2008 – 2009 *Water Resources Engineer*, Black & Veatch, Charlotte, NC
- 2003 – 2007 *Research Assistant*, Institute of Marine Sciences, University of North Carolina at Chapel Hill, Morehead City, NC
- 2005 *Instructor*, Human Impacts on Estuarine Processes, Institute of Marine Sciences, University of North Carolina at Chapel Hill, Morehead City, NC
- 2005 *Instructor (co-taught)*, Environmental Science, Carteret Community College
- 2000 – 2002 *Project Engineer*, Limno-Tech, Inc. Ann Arbor, MI
- 1998 – 2000 *Environmental Engineer*, Howard R. Green Company, Cedar Rapids, IA
- 1997 – 1998 *Research Assistant*, Department of Civil and Environmental Engineering, University of Iowa, Iowa City, IA
- 1996-1997 *Teaching Assistant*, Department of Civil and Environmental Engineering, University of Iowa, Iowa City, IA

Professional Certifications

Professional Engineer, Michigan 2002 and North Carolina 2008

Honors and Awards

- Board of Governors Fellowship, University of North Carolina, (2002)
- Iowa Water Pollution Control Association Scholarship, University of Iowa (1997)
- Tau Beta Pi National Engineering Honor Society (1996)
- Outstanding Student Poster Awards, Water Resources Research Institute, Raleigh, NC. (2006), American Society of Limnology and Oceanography, Atlanta, GA (2004)

Synergistic Activities

- Faculty Advisor, Society of Women Engineers (2010-present)
- Fellow and Internal Advisory Board Member for Infrastructure, Design and Environmental Sustainability Center, UNC Charlotte (2009-present)
- Invited speaker: Geography and Earth Sciences Seminar Series, UNC Charlotte (2010)
- Panel Reviewer for National Science Foundation; Peer Reviewer for Journal of Environmental Quality, Biogeochemistry, Environmental Pollution
- Faculty Competitive Grants Committee, UNC Charlotte (2010-2012)
- Service to NC AWWA-WEA: Water Resources Committee Chair (2009); Annual Conference, “Drought Issues: Local to Global Perspective”, Session Chair (2008); Annual Conference “Endocrine Disrupting Compounds (EDC’s)-What Do They Mean to You?”, Session Chair (2008).

Peer-reviewed publications

- O’Driscoll M., S. Clinton, A. Jefferson, A. Manda and **S. McMillan** (2010). “Review: Urbanization effects on watershed hydrology and in-stream processes in the southern United States” *Water*, 2:605-648; doi:10.3390/w2030605.
- McMillan, S. K.**, M.F. Piehler, S.P. Thompson and H. W. Paerl (2010) “Denitrification of nitrogen released from senescing algal biomass in coastal agricultural headwater streams.” *Journal of Environmental Quality*, 39(1):274-281.
- Ensign, S.H., **S.K. McMillan**, S.P. Thompson, M.F. Piehler (2006). “Nitrogen and phosphorus attenuation within the stream network of a coastal, agricultural watershed.” *Journal of Environmental Quality*, 35(4):1237–1247.
- Winnike-McMillan, S. K.**, Q. Zhang, L. C. Davis, L. E. Erickson and J. L. Schnoor (2003). “Phytoremediation of Methyl Tertiary-Butyl Ether.” *Phytoremediation: Transformation and Control of Contaminants*. Editors: J. L. Schnoor and S. C. McCutcheon, Wiley-Interscience.
- Hong, M. S., W. F. Farmayan, I. J. Dortch, C. Y. Chiang, **S. K. McMillan** and J. L. Schnoor (2001). “Phytoremediation of MTBE from a Groundwater Plume.” *Environmental Science and Technology* 35(6): 1231-1239.

Selected Presentations

- McMillan, S.**, A. Tuttle, G. Jennings and A. Gardner (2011). “Influence of channel complexity on nitrogen retention in restored urban streams” *Water Resources Research Institute 2011 Annual Conference*. Raleigh, NC.
- Garris, N. E., **S. K. McMillan**, and S. M. Clinton (2010). “Patterns of N and P uptake across urban headwater streams with varying levels of urbanization.” *North American Benthological Society Meeting*, Santa Fe, NM.
- McMillan, S. K.**, S. T. Thompson, H.W. Paerl and M. F. Piehler (2006). “Denitrification dynamics in coastal headwater streams: Influence of DOC and nitrate.” *American Society of Limnology and Oceanography Aquatic Sciences Meeting*, Victoria, BC.
- Winnike, S. K.** and J. L. Schnoor. (2000) “Phytoremediation of methyl *tert*-butyl ether (MTBE) by hybrid poplar trees.” *American Chemical Society*, San Francisco, CA.

Professional Affiliations

American Geophysical Union (AGU)
American Society of Limnology and Oceanography (ASLO)
North American Benthological Society (NABS)
American Society for Engineering Education (ASEE)

Supported Research Projects (Current only)

2010-2013 “Impact of stormwater management on ecological function in urban streams”.
National Science Foundation, Environmental Sustainability. \$320,000.
PI: Sara McMillan; co-PIs: Sandra Clinton, Anne Jefferson, Christina Tague

2009-2010 “Catchment scale hydrologic monitoring”, City of Winston-Salem, NC. \$53,500.
PI: Sara McMillan

2010-2011 “Nitrogen retention in urban streams: Implications for ecologically based stream
restoration”. North Carolina Water Resources Research Institute. \$49,500. PI:
Sara McMillan; co-PI: Greg Jennings

Courses developed and taught

PhD/MS level

- Ecological Engineering (3 credits) Fall 2009

Advanced undergraduate level

- Hydraulics and Hydrology (3 credits) Spring 2009, 2010
- Water and Wastewater Systems (3 credits) Spring 2009, 2010, 2011
- Environmental Laboratory (1 credit, 3 contact hours) Spring 2009, 2011
- Watershed Science, co-teach (3 credits), Spring 2011

Introductory undergraduate level

- Computer Application for Engineers (3 credits) Fall 2009, 2010

Students advised

Undergraduate Scholars: Nicole Garris (Biology), Leah Haithcock (Biology), Christopher Lattimore (Engineering Tech.), Brittany Marvel (Engineering Tech.)

Graduate students: Brandon Blue (MS in Geography and Earth Sciences, Aug 2011), Alea Tuttle (MS in Geography and Earth Sciences, May 2012), Alexandra Apple (MS in Civil and Environmental Engineering, Aug 2011), Joshua Moore (MS in Civil and Environmental Engineering, May 2012).

Dissertation/Thesis Committee

Angela Gardner (PhD, North Carolina State University, Biological and Agricultural Engineering), Amy Stephens (PhD, Geography and Earth Sciences), Xuchu (Harry) Meng, (PhD, Geography and Earth Sciences), Fabien Besnard (PhD, Civil and Environmental Engineering)

Teaching Philosophy

My goal in teaching is to provide my students the skills and knowledge they need to be successful, while at the same time instilling a sense of environmental stewardship. In all the courses I teach, I strive to create an atmosphere where students stretch themselves to apply concepts learned in class to solve real-life problems. By creating an interactive learning environment where students are able to find relevance to their everyday lives, they are more engaged and concept retention is higher.

I use multiple methods in my courses, all built around the concept of spiral learning where students are introduced to concepts that build upon each other throughout their coursework. As a result students are more successful in their advanced courses when presented with open-ended questions and are able to tackle environmental issues that do not have one clear answer. For example, students in my Ecological Engineering course (team-taught in Fall 2009) had mastered wastewater treatment concepts, which I built upon when discussing nutrient transformations in streams. By having a fundamental understanding of biologically-mediated chemical reactions, they were able to apply these concepts in multiple systems. Relating new material (fluvial processes) to previously learned concepts (biological reactions), students were able to use newly gained knowledge to solve problems. Another way of reinforcing understanding is to have unifying concepts throughout the course. In my senior level Water and Wastewater Systems course, I revisit the principle of the conservation of mass throughout the course starting with effects of a point source discharge to lake, progressing to biological treatment in wastewater tanks and finishing with constructed wetlands.

Through problem-based learning in field and laboratory exercises, I help students understand how concepts are applied and extended to multiple systems and environments. Students often learn best by applying fundamental concepts to real problems and then teaching these concepts to others. I include opportunities for students to do both of these through creative out-of-class assignments and team projects. When teaching conventional water and wastewater treatment, students work together in teams to research novel, inexpensive alternatives that can be used in developing countries.

I strongly believe that learning does not stop when students leave the classroom and I am committed to offering undergraduate students opportunities to pursue independent research. I currently have three undergraduate students assisting with various research activities and/or pursuing their own research projects. The students are guided by me, but also my graduate students who gain valuable mentoring experience. We hold weekly lab meetings that alternate between research presentations by group members and literature discussions, which the undergraduates are fully engaged in.

I am passionate about ensuring the sustainability of our natural resources while balancing the needs of advancing human society. As part of a cross-college effort, I teamed with faculty from Liberal Arts and Engineering to spearhead an effort to infuse sustainability into the general curriculum. This effort has directly led to development of a new course that I will offer this fall (Sustainable Systems). Great challenges lie ahead of us and the next generation of engineers will be leading the way. Helping students along this path has been an extremely rewarding experience and I am excited to be a part of it at UNC Charlotte.

Demonstration of Teaching Excellence

My first semester at UNC Charlotte was also my first experience developing and teaching a course from start to finish. This was an extremely rewarding, yet challenging experience. While I struggled at times with the amount of time required for class preparation and grading, I gained valuable insights working with faculty colleagues and using on-campus teaching resources. Most importantly, I learned the importance of varying teaching methods and finding ways to show the relevance of these concepts to enhance learning.

Peer reviews and student teaching evaluations have also helped me better facilitate learning by my students. My most recent peer review is attached at the end of this portfolio. I also take informal surveys at mid-semester to help me gauge the level of understanding and interest. For example, this semester many students Water & Wastewater Systems did not have the depth of knowledge I anticipated in basic chemistry. Because of this, we slowed the pace of the introductory material to ensure that students were able to develop depth and breadth of understanding in subsequent application of these principles. I genuinely care about the success of my students and am comfortable changing the pace/methods to ensure that depth of learning occurs.

I've included a summary of my teaching evaluations in the following table which shows that I am consistently rated above the COE average for undergraduate courses. The results from the ETCE 4143 and ETCE 3242 are for the most recent offering (Spring 2010).

Question	ETCE 4143	ETCE 4143L	ETCE 3242	ETGR 1100	COE average
Instructor displays a clear understanding of course topics	4.55	4.86	4.69	4.39	4.47
This course has effectively challenged me to think	4.40	4.43	4.54	4.11	4.27
I feel free to ask questions in class	4.2	4.86	4.49	4.49	4.29
Lecture information is highly relevant to course objectives	4.25	4.86	4.46	4.34	4.24
My instructor is actively helpful when students have problems	4.20	4.57	4.40	4.36	4.28
Overall, I learned a lot in the course	4.25	4.71	4.51	4.25	4.10
Overall, this instructor was effective	4.40	4.86	4.50	4.45	4.12

Some of the comments I've received on these evaluations include:

"The instructor did a good job of teaching the course. She presented the difficult or confusing material easily enough so that it did not become confusing."

"She was a great teacher to have. She knew what she was talking about and did a great job explaining it."

"Very helpful and makes you think about the question you ask before she will answer."

"She is very prepared for this course and understands the material very well."

Mentoring students through Senior Capstone has been a combination of teaching and learning for me. This semester I am currently mentoring two groups: a Civil ET site development project and a Construction Management stream restoration project. The latter CM project has been both within my area of expertise with several research projects in this area, but also completely new in that I knew relatively little about construction practices. Because of this I tapped into many of my resources both in the community and at other universities (e.g. NC State University Stream Restoration Institute). Together with my students, I have met with construction and project managers at Charlotte-Mecklenburg Stormwater Services, gone on site visits and conference calls with design engineers and contractors. Not only have my students put together a great project, but we all have learned a great deal.

I also assisted with a component of a Mechanical ET project last fall and was excited to receive this feedback from them after graduation:

Dear Dr. McMillan,

We the Wind Powered Pond Aeration group want to thank you for all your time and dedication you have put forth to help us achieve our goals for Senior Design 2. We want to thank you for teaching us how to test dissolved oxygen and showing us how to use the dissolved oxygen meter. Without this knowledge we couldn't have tested our pond aerator and got as good of results as we did. We were not anticipating we were going to need this kind of help and when we asked for some assistance you took the initiative to go the extra mile on top of your current work load. We really appreciate your help.

Sincerely,

Justin Bingham, Brent Aldridge, and Jeffrey Roberts

I've been fortunate to have really exceptional students in many of my classes who make teaching enjoyable. When I mentioned my nomination for this award to one of the students in the group of seniors I mentor for the Civil ET Capstone Project course, he promptly sent me the following email and asked that it be included in my portfolio:

To whom it may concern,

I was part of Dr. McMillan's first class when she arrived at our school and she quickly adapted to the atmosphere and the students. I feel like Dr. McMillan truly cares if I learn something. Instead of telling you once and hoping you "get it" she repeats key points and makes sure you understand it before leaving class. She cares about how her students feel. The ability to keep one's hand on the pulse of the class makes a huge difference in the amount of learning that can take place. When the class is bored, she gives more excitement; when the class struggles with a concept she offers encouragement. It's like a performer being able to read an audience, knowing what to say and when to say it.

If anyone were to receive an award for being a great educator I would hope it is Dr. McMillan. Not that I need my favorite teachers to receive awards to prove their worth but when someone deserves something they should get it. In this semester alone I have drove to water treatment plants, walked the campus woods, learned more than I ever wanted about wastewater, and participated in "Campus-Cleanup" because of Dr. McMillan; and I have loved every minute of it.

Best regards from a grateful student,
Daniel Miller

Continuing Education

When I first joined UNC Charlotte in January 2009, I was immediately impressed by the level of commitment to helping me further develop and enhance my teaching skills. I participated in several workshops at the UNC Charlotte Center for Teaching and Learning, met regularly with my ADVANCE mentor (Dr. Craig Allan, Geography & Earth Sciences) as well as my department mentor (Nan Byars, Engineering Technology). The mentoring relationships I have built have been instrumental to my success through guidance on curriculum development, teaching philosophy and class-room approach. I've also been informally mentored by Dr. Helene Hilger who has demonstrated excellence in teaching through her commitment to student learning. I have visited Dr. Hilger's and Dr. Allan's classes several times as an informal way to learn effective teaching strategies

My overall goal is to develop higher-order thinking by encouraging students to think critically about concepts and apply them to solve problems, not just regurgitate facts and equations. To enhance my abilities to do so, I attended a workshop on critical thinking held through the UNC Charlotte Center for Teaching and Learning. This was interactive session where I learned new strategies to encourage critical thinking at all levels of instruction. I am also registered to participate in a 3-day teaching workshop in May 2011 with Dr. Jerry Samples a coordinator and leader with ASCE ExCEED Teaching Workshops. The intense workshop will include individual peer reviews of my teaching as well as instruction on teaching and learning through classic and innovative approaches.

Curriculum Development

Through the past 2 years, I have actively developed new courses, enhanced and restructured courses and participated in University wide curriculum development efforts. My first semester at UNC Charlotte in January 2009, I developed and taught three courses: Water and Wastewater Systems (ETCE 4143), Environmental Laboratory (ETCE 4143L) and Hydraulics and Hydrology (ETCE 3242). In the Fall 2010 semester, I led a freshman-level course (Computer Applications, ETGR 1100) aimed at providing ET students the computer skills to be successful in their program and their careers. I also team-taught a graduate level course in my area of expertise (Ecological Engineering, CEGR 6090-8090) with Dr. Helene Hilger and Dr. Sandra Clinton, which was an entirely new course that we developed together. During this academic year, I taught or am currently teaching the same undergraduate courses. I am also team-teaching Watershed Science (ESCI 4155) with Dr. Craig Allan, which includes a mixture of undergraduates and graduate students from Engineering, Earth Sciences and Biology. Details for each course are summarized in the following paragraphs.

Water & Wastewater Systems (ETCE 4143): Students in this course learn fundamental biological, chemical and physical processes and how to apply them to engineered water and wastewater treatment systems. Over the past three offerings of this course I have developed a new component on emerging issues in water resources which includes ecological engineering approaches to wastewater treatment, water reuse and technology applications for developing nations. I've also refocused the course on the theme of sustainability with out-of-class assignments that encourage them to think globally about issues of clean and healthy water supply. In the Spring 2010, the Environmental Lab elective was not offered so I included several laboratory and field experiments which resulted in a combination of in-class discussion, hands-on experimentation and field trips. In all semesters, students participate in the field trips to the water treatment and wastewater treatment plants operated by Charlotte-Mecklenburg Utilities which allow students to get a feel for the scale of the processes and the interactions among them. I have attached the course syllabus at the end of this portfolio.

Environmental Laboratory (ETCE 4143L): I significantly restructured and enhanced this course through development of additional laboratory activities and organization into modules: (1) water treatment, (2) wastewater treatment and (3) environmental systems. Students work in teams of 3-4 students to develop leadership, team-work and communication skills. This is a writing-intensive course with project reports completed by the groups at the end of each module. To facilitate development of their communication skills, students turn in draft reports, receive feedback and resubmit for final grading.

Hydraulics & Hydrology (ETCE 3242): This course is a challenging course for our students and required flexibility in teaching approach. I demonstrated my ability to enhance learning outcomes and teaching approaches in response to student feedback. Specifically, I made several changes based on things I learned during the previous semester I taught this course. I adopted a new edition of the textbook which had additional examples and more homework problems (one of the primary difficulties with the previous textbook) which minimized the need for supplemental text in most cases. I limited the breadth of content covered, particularly in the unit on hydrostatic forces to allow greater time to devote to in-depth learning of fundamental concepts regarding pipe flow and hydrology. Through Moodle, I was able to provide additional resources and solutions to homework assignments.

Computer Applications (ETGR 1100): While the course had previously been developed to offer consistent instruction in basic software applications, I made significant enhancements to the course of study. Specifically, I worked with previous instructors of this course, the ET Freshman FAIT committee members and current instructors of ETGR 1201 to better align topics between the ETGR 1201 and 1100. This facilitated learning and application of software for my students by providing them additional opportunities to apply what they've learned. To enhance the use of technology in the classroom, all course content (documents, assignments and exams) are completed through Moodle. I also developed projects that were completed by the students at the end of the modules that demonstrated integration of the key concepts learned.

Watershed Science (ESCI 4155): I am currently co-teaching this course with Dr. Craig Allan in the Department of Geography and Earth Sciences. The course enrollment is a mix of undergraduates and graduate students which presents a unique opportunity to engage the more advanced students in teaching through group presentations and in-class activities. During the class period, I strive to engage the students through discussion and quantitative analysis of case studies. We have set up the classroom so groups of 3-5 students sit at a table which allows facilitated in-class group discussion among students of different academic backgrounds.

Ecological Engineering (CEGR 6090/8090): I co-taught this course with Dr. Hilger from Dept of Civil and Environmental Engineering and Dr. Clinton from Dept. of Biology. I led one-third of the course which included topics on water quality, aquatic biogeochemistry and stream restoration. This graduate level course was highly interactive and discussion oriented. I challenged students to move beyond their comfort levels by critically analyzing peer-reviewed literature and guiding semester-long projects. This was an entirely new course to develop for me, but one I enjoyed thoroughly.

Sustainable Systems (ETGR 3000): I am currently developing a new course that will be offered during the Fall 2011 semester. The course will focus on sustainability as it applies broadly to

engineering analysis, design and implementation. Key topics will include energy, water resources, infrastructure, industrial applications (material selection, disposal, marketing), economics and social justice. Students will learn methods to assess and incorporate sustainability across multiple disciplines and have the opportunity to design a system sustainably through a group project. I have attached the course syllabus at the end of this portfolio.

Student Outreach

I strongly believe that learning does not stop when students leave the classroom and I am committed to offering undergraduate students opportunities to pursue independent research. I currently have three undergraduate students assisting with various research activities and/or pursuing their own research projects. The undergraduate students are guided by me, but also my graduate students who gain valuable mentoring experience. I also firmly believe in a cohesive research group with students who assist each other at all phases of the process. We hold weekly lab meetings and undergraduate students actively participate by making presentations of their work and leading literature discussions.

Nicole Garris starting working in my lab as a research assistant in Summer 2009. I supervised her independent research during Fall 2009 during which time she performed laboratory and field experiments on nitrogen cycling in urban streams. The final result of this work was a literature review paper and a poster which she presented at the 2010 North American Benthological Society Annual Meeting in June 2010 in Santa Fe, NM. Two undergraduates in Engineering Technology (Chris Lattimore, Brittany Marvel) also work with my research group. They have quickly developed the skills and passion necessary to be successful civil engineering technologists. With interests in several areas of the field, they have sought my guidance on coursework and internships to best prepare them for future careers.

I recently was awarded a 3-year research grant through the National Science Foundation on stormwater biogeochemistry. Although not part of the original award, I applied for and received a Research Experience for Undergraduates (REU) position. The REU student will participate in the larger project studying the effects of stormwater management on ecosystem function (e.g. nutrient dynamics, biological integrity, temperature attenuation and hydrology) in urban streams. The student will learn field and laboratory techniques, experimental design and data analysis to develop his/her own research project within this topic. The student will write a report in the format of a scientific paper and give a presentation on their project at the end of the summer and be encouraged to submit an abstract of their work for presentation at a scientific meeting (e.g. American Geophysical Union).

I am also committed to enhancing the success of women and minorities in science and engineering. I currently serve at the Society of Women Engineers faculty advisor. This experience has allowed me to assist with professional development of bright and motivated women. The UNC Charlotte College of Engineering's Women in Science and Engineering (WISE) program is a new on-campus learning community designed to support women students. I have made plans to participate in one of the monthly dinner meetings to encourage and identify opportunities for undergraduates to participate in research.

ETCE 4143 – Water and Wastewater Systems

Spring 2011

Instructor: Dr. Sara K. McMillan, P.E. smcmillan@uncc.edu

Office Hours: Smith 235: MW 10:30 – 12:00; other times by appointment

Course Objectives:

The objectives of the course are to provide a working knowledge of the concepts, terminology, and basic calculations used in the water and wastewater areas of environmental engineering. Students successfully completing this course should be able to:

- Understand the roles of chemistry and biology as they apply to water pollution, water and wastewater quality, and water and wastewater treatment,
- Apply the principles of material balances to solve problems in water and wastewater collection and treatment,
- Identify, analyze and design water treatment processes and systems,
- Identify, analyze and design wastewater treatment processes and systems,
- Describe and utilize LEED and other green evaluation and certification systems; and
- Incorporate sustainability concepts in the design of hydraulic, hydrologic and environmental engineering systems.

Required Text:

Environmental Engineering: Fundamentals, Sustainability, Design. James R. Mihelcic, Julie Beth Zimmerman. ISBN: 978-0-470-16505-8.

Field Trips:

There will be two field trips during the semester to Charlotte-Mecklenburg Utilities water and wastewater treatment plants and attendance is required.

Topics List:

1. Sustainability & Ecosystems
2. Environmental measurements
3. Materials balance
4. Chemistry and Biology review
5. Water treatment
 - a. Regulations
 - b. Unit processes – design and analysis
6. Wastewater treatment
 - a. Regulations
 - b. Unit processes – design and analysis
7. Green Engineering
8. Constructed Wetlands for Wastewater Treatment
9. Water Reuse

ETGR 3000 – Sustainable Systems
Fall 2011

Instructor: Dr. Sara K. McMillan, P.E., smcmillan@uncc.edu

Objectives:

The course will focus on sustainability as it applies broadly to engineering analysis, design and implementation. Key topics will include energy, water resources, infrastructure, industrial applications (material selection, disposal, marketing), economics and social justice. Students will learn methods to assess and incorporate sustainability across multiple disciplines and have the opportunity to design a system sustainably through a group project.

Topics List:

1. Sustainability, ecological footprint (water, carbon)
2. Climate change, GHG sources/sinks, carbon trading
3. Materials Balances (examples from manufacturing operations, construction practices – focus on scale, efficiency/reuse)
4. Industry
 - a. Sustainability & economics (payback period, triple bottom line, exchange/trading)
 - b. Energy Audit
 - c. Life Cycle Assessments (analysis tools, metrics)
 - d. Environmental compliance
 - e. Pollution Prevention
5. High Performance Buildings and Infrastructure
 - a. Energy efficiency
 - b. Sustainable materials
 - c. LEED
 - d. Transportation
6. Water Sustainability
 - a. Changing water regimes
 - b. Low impact development, urban hydrology
 - c. Stormwater control measures (SCMs)
 - d. Water infrastructure (water reuse, aquifer storage, gray water/rain water harvesting)
 - e. Sustainable agriculture
 - f. Designing for developing world
7. Renewable Energy
 - a. Wind
 - b. Biofuels, waste to energy
 - c. Solar
 - d. Fuel cells

The Peer Review of Teaching, Part 4: Visitation Summary Report

William States Lee College of Engineering, Department of Engineering Technology
(To be submitted to the Reviewee, Mentor, Department Chair and Review Committees)

Reviewee Name: Sara McMillan Review Semester: Spring Year 2011

Part-time Tenure-Track Tenured, Associate Prof. Tenured, Full Prof.

Reviewers Names: Bruce Gehrig, Peter Schmidt

Course Title: Water and Wastewater Systems Number of Students Enrolled: 51

Brief Description of the course pedagogy: My overall goal is to encourage and challenge my students to think holistically about natural and engineered systems. Students in this course learn fundamental biological, chemical and physical processes and how to apply them to solve problems. The water and wastewater treatment components are approached from a systems perspective. I revisit the principle of the conservation of mass throughout the course starting with effects of a point source discharge to lake, progressing to biological treatment in wastewater tanks and finishing with constructed wetlands. I strive to create an atmosphere where students feel comfortable asking questions and are exposed to multiple methods of learning. I utilize a combination of PowerPoint (e.g. photos, processes) and note outlines. This approach frees up time previously spent taking notes/drawing figures and contributes to increased class participation and discussion. I include two field trips (water treatment plant and wastewater treatment plant). These allow students to get a feel for the scale of the processes and the interactions among them, but also provide an opportunity to discuss how an environmental career path fits with the construction interests of many of my students.

I genuinely care about the success of my students and am comfortable changing the pace/methods to ensure that depth of learning occurs. This semester, many of my students did not have the depth of knowledge I expected in basic chemistry. Because of this, we slowed the pace of the introductory material to ensure that students were able to develop depth and breadth of understanding in subsequent application of these principles.

• **Pre-observation conference meeting:**

Date held: 4/4/2011

Comments Course materials seem to be well organized and syllabus was comprehensive. Sara prepares partial notes for students in advance and posts materials on Moodle. Takes her course delivery seriously.

• **Teaching Observation:**

Date held: 4/4/2011

Comments Good classroom presence. Used instructional audio/visual technology well. Sara knew the names of all the students and worked to get them engaged. Delivery was organized & well prepared. She was knowledgeable about topics & content was appropriate for senior level course.

CONFIDENTIAL

• **Post-observation conference meeting:**

Date held: 4/4/2011

Comments Everybody thought the lecture went well. Course subject matter is really difficult to get the students engaged in as it is outside most of their interests areas. Sara was very open to receiving constructive comments on her teaching.

• **General Observations and Recommendations:**

Sara has strong teaching skills and a strong desire to improve her teaching. Sara is an asset to the civil engineering technology program and we are fortunate to have her as part of the ET Department.

• **Signatures:**

Reviewee: _____ Date: _____

Mentor: _____ Date: _____

Reviewer: Bruce D. [Signature] _____ Date: 4/6/2011

Reviewer: _____ Date: _____

UNC CHARLOTTE
University of North Carolina, Charlotte
College of Engineering

Run Date:
5/31/2010

Department of ETGR - Question Set I

Year: 2010
Term: Spring
Instructor: MCMILLAN

Course Prefix: ETCE
Course Number: 3242
Section Number: 001

Number Enrolled: 54
Course Respondents: 35
Dept. Respondents: 1530

Question	Course					Mean/Standard Deviation					Level						
	SA	A	N	D	SD	#	Omit	Course	Dept.	College	1000-2000	3000-4000	5000-Above				
My instructor displays a clear understanding of course topics.	27	6	1	1	0	1	1	4.69	0.67	4.43	0.72	4.47	0.74	4.47	0.76	4.58	0.66
My instructor has an effective style of presentation.	18	13	3	0	1	1	1	4.34	0.86	3.81	1.06	4.03	1.02	4.01	0.98	4.02	1.05
My instructor seems well-prepared for class.	23	9	2	1	0	1	1	4.54	0.73	4.18	0.85	4.31	0.83	4.30	0.80	4.29	0.86
My instructor displays enthusiasm when teaching.	23	11	1	0	0	1	1	4.63	0.54	4.07	0.93	4.27	0.87	4.25	0.86	4.24	0.89
This course has effectively challenged me to think.	21	13	0	1	0	1	1	4.54	0.65	4.17	0.90	4.25	0.89	4.20	0.86	4.27	0.91
My instructor makes good use of examples and illustrations.	21	12	1	1	0	1	1	4.51	0.69	4.02	0.95	4.15	0.93	4.14	0.90	4.14	0.96
My instructor is readily available for consultation.	19	10	2	4	0	1	1	4.26	1.00	3.91	0.95	4.11	0.94	4.09	0.92	4.11	0.96
My instructor returns papers quickly enough to benefit me.	15	12	5	2	1	1	1	4.09	1.02	3.77	1.12	3.99	1.04	3.94	1.05	4.01	1.03
I feel free to ask questions in class.	20	13	1	1	0	1	1	4.49	0.69	4.15	0.83	4.30	0.82	4.28	0.81	4.30	0.83
The climate of this class is conducive to learning.	19	11	3	1	1	1	1	4.31	0.95	4.02	0.90	4.16	0.89	4.14	0.88	4.15	0.91
Lecture information is highly relevant to course objectives.	20	12	2	1	0	1	1	4.46	0.73	4.18	0.84	4.25	0.86	4.22	0.84	4.26	0.87
There is sufficient time in class for questions and discussions.	20	12	2	1	0	1	1	4.46	0.73	4.06	0.84	4.21	0.84	4.17	0.83	4.21	0.85
Grades are assigned fairly and impartially.	20	11	2	2	0	1	1	4.40	0.83	3.99	0.98	4.13	0.96	4.12	0.91	4.10	1.00
I am generally pleased with the text(s) required for this course.	17	10	2	2	4	1	1	3.97	1.34	3.63	1.05	3.81	1.10	3.79	1.09	3.79	1.11
Course topics are dealt with in sufficient depth.	20	11	2	1	1	1	1	4.37	0.93	3.86	0.97	4.03	0.98	4.02	0.93	4.02	1.01
My instructor speaks audibly and clearly.	22	11	1	0	1	1	1	4.51	0.81	3.86	0.97	4.34	0.82	4.32	0.85	4.33	0.81
My instructor deals fairly and impartially with me.	24	8	2	1	0	1	1	4.57	0.73	3.86	0.97	4.36	0.77	4.40	0.73	4.34	0.80
My instructor explains difficult material easily.	19	12	3	1	0	1	1	4.40	0.76	3.86	0.97	4.07	1.03	4.19	0.93	3.99	1.09
Course assignments are interesting and stimulating.	18	12	4	1	0	1	1	4.34	0.79	3.86	0.97	4.04	1.00	4.12	0.95	3.99	1.03
My instructor is actively helpful when students have problems.	20	11	2	2	0	1	1	4.40	0.83	3.86	0.97	4.27	0.86	4.28	0.83	4.27	0.88
I understand what is expected of me in this course.	21	11	2	1	0	1	1	4.49	0.73	3.86	0.97	4.24	0.90	4.30	0.82	4.19	0.96
Overall, I learned a lot in this course.	23	8	3	1	0	1	1	4.51	0.77	3.96	0.98	4.12	0.98	4.10	0.94	4.10	1.01
Overall, this instructor was effective	21	10	2	1	0	2	2	4.50	0.74	3.87	1.05	4.14	1.01	4.13	0.96	4.11	1.05



UNC CHARLOTTE

The University of North Carolina at Charlotte
9201 University City Boulevard
Charlotte, NC 28223-0001

Department of Geography and Earth Sciences

704 / 687-5973

Fax 704 / 687-5906

April 6, 2011

To the Excellence in Teaching Award Committee

I am writing to strongly support for Dr. Sara McMillan's nomination for the Excellence in Teaching Award on the Undergraduate Level. In my opinion this is a well deserved nomination. I have served as Dr. McMillan's external faculty mentor since her arrival at UNC Charlotte. From our mentoring meetings I can attest that Sara is a conscientious instructor who puts in a tremendous amount of time and energy in honing her craft. She cares deeply about her student's success and constantly strives to innovate in the classroom. I have had the opportunity to directly observe her work in the classroom during the present semester as she has volunteered to team teach my Watershed Science course with me. This effort is completely voluntary and is taught on her own time. The course is an evening offering and represents a teaching overload in a college separate to her own. Dr. McMillan is a dynamic instructor in the classroom. Her lectures have been well organized, clearly presented and contain very up to date material. Dr. McMillan has made effective use of in class group assignments during most of our class periods. This has been especially effective in this 4000/5000 class offering which contains an almost 50/50 mix of undergraduate and graduate students. The course material is very interdisciplinary blending topics in hydrology, geochemistry, soil science and ecology. It has taken me years to find the appropriate blend of material and the right level of difficulty for our students. I think Dr. McMillan has hit the ground running in this course and the students have greatly appreciated her efforts. In my view Dr. McMillan is an extremely talented instructor and a wonderful role model for female engineers and scientists. Our students are fortunate to have her at this institution.

Yours Truly

Craig Allan
Professor and Chair



IDEAS Center
Infrastructure, Design
Environment & Sustainability

9201 University City Boulevard, Charlotte, NC 28223-0001
t/ 704-687-4373 f/ 704-687-3115

April 7, 2011

Dear College of Engineering Teaching Award Selection Committee:

I am pleased to write a letter in support of Dr. Sara McMillan's nomination for the College's prestigious outstanding undergraduate teaching award for 2010-2011. Dr. McMillan's dynamic personal style and commitment to her work are evident to anyone who meets her. I was fortunate to have the opportunity to observe her teaching and interaction with students when we team-taught a course in Ecological Engineering in Fall 2009. Not only did she bring her strong expertise in stream science and engineering to the course content, but she engaged the students with good lecture content and exposure to the stream restoration literature.

Dr. McMillan uses diverse teaching modalities, including well-planned PowerPoints (that are not read to the students but interpreted for them); well organized lecture notes, guided small group discussions (followed by debriefings); and small group presentations. I thought she did a particularly good job of finding ways to keep both undergraduates and graduates cohesive while still making it clear that more was expected of the graduate students.

I know that student satisfaction with the course was very high. This was a content area not offered at many universities, and Dr. McMillan's expertise made it possible for us to offer a course here that was unique and of high value. Because much of Dr. McMillan's lessons involved field work, she organized field trips and stream observation experiences that motivated many students to explore this area of study more. It seemed to "open some eyes" to this area of engineering. In fact, Dr. McMillan arranged for one of her collaborators, Dr. Greg Jennings, to come to class for a guest lecture. Dr. Jennings is a national expert in stream restoration work, and people come from all over the country to take his seminars. I think students understood and appreciated that this was a special opportunity for them to hear from one of the leaders in this field.

In closing, I will add that Dr. McMillan agreed to teach this course with me because she didn't want to miss the chance to teach this particular content. She got no teaching credit for it in her own department and taught it as an overload! In my mind, this "says it all" about her commitment to teaching, and I am proud to have her among our college faculty. I believe she is deserving of this reward and will continue to offer excellent classroom experiences and opportunities to our students.

Sincerely,

Helene Hilger
Director, UNC Charlotte IDEAS Center
Assoc. Professor, Civil and Environmental Engineering