

March 15, 2012

**COVER SHEET**

FROM: Targeted Infusion Project's (Environmental Sciences) Team

Tolessa Deksissa, Ph.D. (Principal Investigator)

**SUBJECT: New Courses Proposals: Implementation of the Targeted Infusion Project As a Means to Enrich the Undergraduate Environmental Science Program**

Attached is the new course proposal to implement of the targeted infusion project for the undergraduate Environmental Science program. The Targeted Infusion Project is funded by the National Science Foundation for three years (09/2011-08/2014) at about \$300K to develop and implement three interdisciplinary new courses. It is also to infuse environmental and sustainability concept across the curriculum. The proposed new courses are:

1. Environment and Sustainability (3 credits, hands-on) - 100 level
2. Environmental Studies and Sustainability (3 credits) – 300 level
3. Urban water quality management (4 credits, lecture/lab) – 300 level

These three courses are designed to attract and retain the under-represented minority students in environmental sciences and related STEM fields, including engineering by introducing more hands-on experiences with the latest lab technologies, team-taught and peer-to-peers learning approaches. These courses are expected to enhance the undergraduate environmental sciences program and related fields, increase student enrollment retention, prepare the graduates of the program more competitive for the 21<sup>st</sup> century workforces.

Please review the attached document and sign.

Thank you.

CURRICULUM PROPOSAL GUIDELINES: COURSE OFFERINGS

UNIVERSITY OF THE DISTRICT OF COLUMBIA

UNIVERSITY SENATE

ACADEMIC COURSES

TRANSMITTAL FORM

TYPE OF REVIEW REQUESTED: New Courses

  
Tolessa Deksissa (PI)/Targeted Infusion Project/ Environmental Sciences/CAUSES 03/19/2012

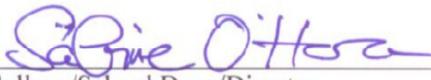
Initiated by (name, program/department, college/school) \_\_\_\_\_ Date \_\_\_\_\_

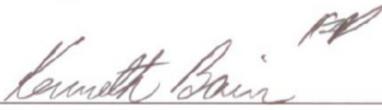
NONE  
Program Coordinator (if required) \_\_\_\_\_ Date \_\_\_\_\_

NONE - ONLY THE COLLEGE/CURRICULUM COMM.  
Department Curriculum Committee Chair \_\_\_\_\_ Date \_\_\_\_\_

MULTI-DISCIPLINE - NO ONE DEPT.  
Department Chair \_\_\_\_\_ Date \_\_\_\_\_

  
College/School Curriculum Committee Chair 03-18-2012  
Date \_\_\_\_\_

  
College/School Dean/Director 03-19-2012  
Date \_\_\_\_\_

  
Provost 3-19-2012  
Date \_\_\_\_\_

ENVIRONMENTAL SCIENCES AND URBAN SUSTAINABILITY  
UNDERGRADUATE PROGRAM  
NEW COURSES PROPOSAL

**Executive summary**

The purpose of this proposal is to develop and implement **three new courses** in the undergraduate program of Environmental Sciences and Urban Sustainability as a means to attract and retain qualified students. It is part of a three-year Targeted Infusion Project (see Appendix A) funded by the National Science Foundation (09/2011 – 08/2014). The implementation of three new courses would **enrich** the undergraduate environmental science curriculum and infuse sustainability concepts and practices across disciplines at UDC. An affordance of implementing these three new courses would be to prepare students for the 21<sup>st</sup> century workforce. To satisfy the goals and objectives set forward by the curricular infusion each of the newly developed courses would expand the pedagogical approach to include experiential learning. Each of the new courses would integrate hands-on experiences, peer –to-peers learning, infusing sustainability concepts, data mining techniques and use of cyber technology to meet learning objectives. The experiential pedagogical approach is expected to significantly impact student engagement, collaboration, and learning. More specifically, hands-on techniques such as data mining will improve students analytical and problem solving skills. Experiential learning has also been linked to increased student retention, higher grades, critical thinking skills development, and active engagement with epistemology.

The proposed three courses include (1) a 3-credit summer course that will attract and prepare senior high school students for college in the environmental science majors; (2) a 3-credit environment and sustainability sciences course for non-majors; and (3) a 4-credit (lecture/lab) urban water quality management course for majors and non-majors. All three courses are designed to complement the existing BS courses of environmental sciences and sustainability. All of the courses will employ team-teaching involving two or more faculty from different disciplines. The infused approach will draw upon existing laboratory facilities and personnel to implement the proposed courses. No additional staff or facilities may be required.

The summer course will include a three-week full day (75 contact hours) interdisciplinary hands-on experience designed to prepare senior high school seniors students for college. The summer course is not free for students unless they will ultimately get enrolled at UDC as degree seekers. Students who successfully complete the summer course would have their summer tuition fee of \$800.00 waived in their second year of study at UDC. This tuition incentive will attract underrepresented minority students to the summer course as well as increase enrollment in the BS degree of environmental sciences. The summer course would be implemented in July, 2012, whereas the other two new courses would be implemented starting in the fall semester of 2012.

### **Justification and need**

The recent study for the University of the District of Columbia indicated that 40% of the college-bound high school seniors and 25% of adults are interested in “environment or sustainability” issues. Environment and sustainability fields are the third most popular among high school seniors. Although there is high demand to study environmental science and sustainability, the existing UDC curriculum has been unable to attract a reasonable number of students. Student enrolment in the undergraduate program of environmental science remained very low (<1%) demonstrating little to no growth in recent semesters. As the land grant and the only public institution in DC, UDC is mandated to serve or educate all DC residents and thus needs to attract underrepresented minority students into stem fields and the hard sciences, which include environmental sciences and sustainability. In order to attract and retain underrepresented DC students, updating the existing curriculum of environmental sciences by infusing sustainability and environment topics into the course content, adapting the pedagogical approach to include experiential learning and including technological tools and application to facilitate learning are of paramount importance.

In this proposal, three new courses are proposed, including a 3 credit summer course for the high school seniors, a 300-level environment and sustainability for non-majors and a 300-level 4-credit (lab/lecture) urban water quality management courses for majors and non-majors alike. The 300 level courses are designed to complement the existing BS courses of Environmental Sciences and Sustainability. They can also serve as electives for other disciplines, including the School of Engineering and College of Art and Sciences. The new courses will employ active-learning approaches such as problem-based learning peer-to-peer instruction and group projects, laboratory exercises, and field survey. In addition, data mining techniques and the use of dynamic interactive online learning (cyber technology) will be integrated to facilitate student learning outcomes. Previous research has demonstrated that experiential learning engages students and increases their analytical and critical thinking skill (citation needed). Therefore, this will enhance our targeted underrepresented student success in sciences, including environmental sciences.

### **Congruence with academic unit objectives and university mission**

As an urban land-grant institution of higher education, one of the missions of UDC is serving the DC residents to change the quality of their life, which is partly to prepare students for immediate entry into the workforce. According to the current UDC’s strategic plan, UDC needs to play a leadership role in area of environment and sustainability initiatives. The College of Agriculture, Urban Sustainability and Environmental Science (CAUSES) was created to meet this mission. The proposed three new courses will not only attract underrepresented minority students, but also prepare them for 21st century workforce skills. Consistent with the land grant mission of UDC as well as CAUSES, updating the undergraduate program of environmental science curriculum with more relevant courses that engage learners with hands-on experiences is crucial.

The proposed three courses are designed to improve the existing environmental sciences and urban sustainability curriculum in order to increase the program visibility as well as the students’ learning

experience. The summer course of environment and sustainability is designed to attract and prepare high school seniors for college success and retention, especially to pursue environmental science and engineering. The first 300-level environment and sustainability course is designed for non-majors as an elective course or a general education requirement. The second 300-level course is an urban water quality management course, which is designed for environmental majors and non-majors alike as a core elective. This course will also serve as a foundation for students who might consider pursuing the new Professional Science Master's degree in Water Resources Management at UDC.

When the 300 level courses can be taken as core elective for majors and non-majors, the summer course introduces basic sciences and engineering concepts, the other two courses will enforce and develop master skills such that students will be able to use science and technology to solve environmental problems (Appendix D). Consistent with the mission of UDC to become the leader in environment and sustainability sciences, these three courses fulfill a vital role. The proposed courses will enhance the undergraduate program of environmental science to support the university's mission in preparing students for the environment and sustainability workforce.

#### **Avoidance of duplication or overlap with existing courses or programs**

The proposed courses are designed carefully to complement the existing courses as a free or core electives in the department of environmental sciences and urban sustainability to increase the coherency and synergy among courses across disciplines or colleges. The proposal does not duplicate the existing course or content, however it introduces new techniques and concept to motivate students to pursue environmental sciences and engineering.

#### **Relationship with other programs/departments ....**

The summer course was designed to prepare senior high school students for college while attracting them to UDC STEM disciplines, especially science and engineering undergraduate programs. The 300-level Environment and sustainability course was designed for non-majors, including students in the social sciences. The objective of the course is to infuse basic principles of environmental science and sustainability across disciplines at UDC including environmental science, biology, engineering, business and social sciences. The 300-level urban water quality management course (lecture/lab) was designed for the environmental science majors and non-majors, especially those in the STEM fields. All three courses are designed to be team taught in collaboration with CAUSES and SEAS.

#### **Number of students immediately affected**

The two 300-level courses are proposed to be core or free electives and any student from any discipline can take the course. The summer program is specifically designated for graduating HS seniors and entering freshman.

### **Standard of relevant accrediting agencies**

The proposed courses are designed to enhance the undergraduate program of environmental science and sustainability. There is no special accrediting agency for this program.

### **Effect on student development, employment or program effectiveness**

All three new courses are designed to engage student by using hands-on activity and experiential learning approach in order to prepare students for the employment. The summer courses will encompass a team based learning activities with hands-on environmental sciences and sustainability activities. This course will motivate students to pursue environmental science program at UDC or elsewhere. It was also designed to prepare student for college as it is an interdisciplinary course that will increase student's analytical and problem solving skills. It will serve as an anchor course for environmental science or engineering.

The 300 level courses will develop in students the ability to apply basic principle of environmental sciences and sustainability, including managing our natural resources. Environment and sustainability course is designed for non-majors to prepare UDC students for the 21<sup>st</sup> century workforce. The urban water quality management course will train students to become competent in the theoretical knowledge and practical application of environmental sciences and water quality.

### **Course description**

*1. Environment and sustainability summer course (3 Credit) – Environment and sustainability summer course is a 3-credit interdisciplinary summer program designed to prepare a senior/graduating high school student for college. It is a pilot and interdisciplinary hands-on summer- course titled Environment and Sustainability. This three weeks (75 contact hours) summer course will focus on developing students' learning and problem solving skills by engaging them in hands-on activities of environmental sciences and technologies, water quality, climate change, information technology, ecosystem interaction, and engineering design. The summer course will be developed and taught by a team of faculty from CAUSES and SEAS. The teaching method will involve face-to-face lectures and online delivery, including assignments that require team work, lab analysis and field studies. A dynamic and interactive online instruction for a mobile delivery will be developed to enhance student learning. See course syllabus in Appendix B. Upon successfully completing the course, student will be able to demonstrate competence in analytical and quantitative skill, articulate basic principle of environment and sustainability, apply information technology to compile and communicate sciences, and analyze environmental data to investigate solutions. See course syllabus in Appendix B.*

2. *Environmental studies and sustainability* (3 credit) – This course is a 300-level interdisciplinary course designed for non-majors. This 3 credit course is designed to be taught by a team of faculty from two or more schools. The introduction to environmental science and sustainability course is an interdisciplinary course designed for non-majors. It introduces students to how the wellbeing of humans is integrally linked to the wellbeing of the other species with which we share the planet. It focuses on the fundamental principles of environment and sustainability concept. The course content includes environmental impact, water quality, transportation and energy use, built environment, ecosystem services, biodiversity, climate change and green business. It will enable students to make an informed decision on their daily activity to protect environment. See course syllabus in Appendix C.

3. *Urban water quality management* (4 credits, lecture + lab)-The urban water quality management course is designed to enhance students' competence in theoretical and practical application of water quality sciences and technology to address urban water quality management. This new team-oriented, experiential and problem based multidisciplinary course on urban water qualities is open to majors and non-majors alike. The course will cover wide array of activities including field experiences and laboratory analyses. The course will cover some concepts in environmental policy, water quality, urban runoff, and sustainable development of interest to students from all majors. This course will be team-taught by mainly two schools (CAUSES and SEAS) in upper level divisions for all students. See course syllabus in Appendix D.

#### **Adequacy and appropriate qualification of current faculty and support staff**

There are adequate and appropriate qualified faculties and staff to teach the proposed new courses. The Department of Environmental Science and Sustainability has mainly 4 full time faculties/instructors and staff: Dr. Mohammed Elhelu, Chair/Professor, and Mr. Thomas Kakovitch, Associate Professor, and Dr. Tolessa Deksissa, a program director of the Professional Science Master's in Water Resources Management, and Mr. Alexander Wooten, a PhD candidate and lab technician. In addition, the new courses are designed to be team taught and will be developed and implemented in collaboration with the principal investigators of the target infusion project. All PIs are all well qualified researchers and educators. The member of PIs include Dr. Tolessa Deksissa (PI and Specialized in Environmental Science and Water Quality), Dr. Pradeep Behera, Associate Professor (Co-PI and specialized in civil engineering and hydrology and hydraulics), Dr. Lily Liang, Associate Professor (Co-PI and specialized in Computer science and data mining), and Dr. Suzan Harkness (assistant dean and expert in the application of cyber technology for teaching and learning). The PIs are responsible for developing and implementing the new courses. In addition, the project funding supports one adjunct and one graduate assistant per year. The project budget also includes two undergraduate research assistants per year to implement the summer course.

### **Adequacy of current facilities, supplies and equipment, and library and technical resources.**

The summer course will be offered during summer when there will be adequate class room and lab facilities. Supplies and equipment are funded by the project for three years. There will be a mobile climate change laboratory to educate and inspire students to understanding complex processes, specially the effect of greenhouse gasses. In addition, students will be provided an IPDA iPad (borrowed from the learning resources division) to get access to the digital library during the course.

For the two 300-level courses, an appropriate classroom arrangement is required. It is anticipated that introduction to environment and sustainability will be offered during Fall Semester, whereas urban water quality management can be offered during Spring Semester. For the urban water quality management course, students will have access to two state-of-the-art environmental quality testing laboratories: Water quality testing lab, Room 44-217, and Environmental Quality lab, room 42-110. Water quality testing lab is equipped with the lab equipment that measures Dissolved oxygen, pH, specific conductance, nitrate, ammonium and ammonia nitrogen, total organic carbon, total nitrogen, total phosphorus, orthophosphate, lead and copper, and chlorine residue, total suspended solids, etc. Environmental Quality Laboratory is equipped with very expensive equipment, including Gas Chromatography and Mass Spectrophotometer (GC-MS) with Electromagnetic Capture Detection, and Inductive Couple Plasma and Mass Spectrophotometer with Liquid Chromatography (ICP-MS with LC). The former measures semi-volatile organic contaminants at very low detection limits, whereas the latter measures elements of earth metals. Lab supplies are included in the NSG grant.

### **Estimated costs, available funds, and probable funding sources**

The available funding from the NSF grant is \$99,931, including 46% indirect costs and the cost to develop and implement the three new courses will not exceed the project budget. UDC will eventually gain more funding from the tuition fee.

### **Identify additional needs, if any.**

The proposed new courses are designed carefully so that they do not require additional needs other than coordination of faculties across disciplines. Specially, the school of engineering and applied sciences and CAUSES need to collaborate in coordinating a team of faculty that could teach all three new courses.

One of the objectives of the summer course was to increase enrollment in the undergraduate study of the environmental sciences program. To achieve this goal, we need to create an incentive to attract student to the program while preparing them for colleges. Two incentives are proposed: (1) students who successfully completed the full three-week summer program and complete the final test will have two incentives. First, they will earn 3 college credits to be transferred to the college of their choice. Second, students will get tuition credit if they enroll in the environmental science or engineering program at UDC.

During the project time, a salary of an adjunct faculty and a summary salary for faculty to teach the summer program are included in the project budget and will not require addition cost to the university.

The other two courses can be implemented with the exiting faculty and does not require the hiring of an additional new faculty.

**Proposed date of implementation**

- Summer course July, 2012.
- Intro to Environment and Sustainability Water Quality

**TARGATED INFUSION  
PROJECT GOALS**

**Appendix A: The Goal and Objectives of Targeted Infusion Project**



**PI: Dr. Tolessa Deksissa, CAUSES**

**Co-PIs: Drs. Pradeep Behera (SEAS), Suzan Harkness (LRD) and Lily Liang (SEAS)**

The proposed Targeted Infusion Project: Enhancing Undergraduate Programs in Environmental Science and Sustainability will update the undergraduate environmental science and other student learning experiences by infusing sustainability throughout the curriculums and enable the development of three needed courses: urban water quality, sustainability with environmental examples, and a summer bridge course for senior high school students. The proposed project is consistent with the University's recent efforts to reinforce its environmental sciences and sustainability programs through curriculum revision and revitalizations. The goals and objectives of this Targeted Infusion Project are as follows:

**Goal 1: Update program content and educational experiences in environmental science to better prepare environmental science majors for 21<sup>st</sup>-century challenges and careers**

Objective 1.1: Update curriculum, course content, and course sequence of the environmental science bachelor's degree and its concentrations.

Objective 1.2: Develop a new team-oriented, experiential and problem based multidisciplinary course on urban water quality, including field experiences, opens to majors and non-majors alike.

Objective 1.3: Incorporate a data mining module into environmental science courses.

Objective 1.4: Incorporate cyber-technology in teaching, research, and learning in undergraduate environmental science courses.

**Goal 2: Infuse sustainability concepts and environmental examples into appropriate courses in engineering, natural sciences, social sciences, business, and other fields.**

Objective 2.1: Pilot this infusion in at least five courses in four different majors of civil engineering programs.

Objective 2.2: Create an interdisciplinary, team-taught environmental science/sustainability focused "general-education" course for non-majors.

**Goal 3: Increase student enrollment and retention in environmental sciences and engineering, especially of underrepresented minority students**

Objective 3.1: Develop and pilot an interdisciplinary hands-on summer-bridge course titled Environment and Sustainability.

3 Credits

100 level course syllabus:

Environment and  
Sustainability

## **Appendix B: Environment and sustainability**

**Course credit: 3 (more hands-on)**

### **Course description**

This course focuses on the development of essential skills necessary to prepare high school seniors or 1<sup>st</sup> year college students for college success in science and engineering curriculum. The purpose of the course is to develop critical thinking and problem solving skills for science and engineering majors through hands-on experiential activities. The curriculum includes environmental sciences, sustainability, water quality, climate change, data analysis, computer application and engineering design modules. Students will gradually build core skills and knowledge and demonstrate competences in environmental processes and applying basic scientific principles to solve problems. At the conclusion of the course, students will be able to demonstrate foundational understanding of physical, chemical and biological processes affecting water quality, analyze environmental data and articulate how engineering solutions play an important role in environmental protection and sustainability.

### **Course objectives (CO)**

Upon successfully completing the course, student will be able to:

- Describe environmental sciences and sustainability concepts and its application to environmental protection and sustainable development
- Applying math, physical, biological and social science to address environment and sustainability issues
- Demonstrate competence in collecting and analyzing environmental quality using state-of-the-art laboratory and field techniques
- Make an informed decision about majoring in environmental science or engineering degree program

### **Student learning outcomes (SLO):**

Upon successfully completing the course, student will be able to:

- Describe the difference in concept between environmental stewardship and sustainability
- Describe the impact of human activities upon the environment, including water, air and soil pollution.
- Apply basic math, science and engineering concepts to describe environmental issues and identify sustainable solutions
- Competently measure water and soil quality in the field and laboratory
- Appropriately analyze and interpret environmental data
- Articulate the challenges and opportunities of environmental sustainability and stewardship

## Course Content

1. Intro to environment and sustainability
2. Technology: Advance computer application
3. Water quality analysis
4. Climate change: Greenhouse gas monitoring
5. Environmental data analysis
6. Introduction to environmental engineering

## Course Requirement and Assessment

To accomplish the stated course objective and student learning outcomes, this three week course will have two sessions:(1) morning session (2 hours) and (1)afternoon session (3 hours). During the morning session, students will be exposed to theoretical foundations that support the course content. Active participation of every student will be required in group discussion and r peer-to-peer instruction.

The afternoon session will be experiential based. Student will be engaged in hands-on activities applying the theoretical knowledge acquired during the morning session. Each learning module will include a real-world authentic laboratory exercise or field study. Following each activity, students will be required to submit one reflective report.

*Activity report* - Each hands-on activity requires a reflective report submitted the next day.

*Weekend study package* - There will be two weekend study packages that students will be required to complete. The weekend packages include text readings, educational video shows, data analysis, computer applications and concept questions. Student must compete and submit for assessment all package curriculums prior to the start of the next week's activities.

*Assessments* – Students will complete four assessments throughout the course. One (1) pre and one (1) post assessment; and two (2) graded assessments.

*Capstone group project* – Each student will complete a capstone project that will culminate the summer program. Each student will work in a small group to complete interdisciplinary projects that includes a field observation, sample collection, lab analysis, computer application, data analysis and the application of an engineering concept. Group projects will include a written report and an oral presentation to the rest of the class.

## Scoring

	<u>Grade Scale (%):</u>	<u>Grade Computations:</u>	
A	90 – 100	8 X Hands-on activity report	30%
B	80 – 89	Exams (including pre and post assessments)	20%
C	70 – 79	2X Weekend study packages	10%
D	60 – 69	Capstone group project	30%
F	<59	Oral Presentation	10%

## Learning activities and assessment

Week/Skill	Date	Content of Learning Activities		
		<b>Morning</b> Demonstration 9:30am-11:30 Am	<b>Afternoon</b> Hands-on 1 pm - 4:00 pm	
1 Developing Theoretical, Lab & Field study skill	M, 16-Jul	Intro to Environment & Sustainability	Measuring greenhouse effect	Pre-Assessment
	T, 17-Jul	Soil quality	Soil quality data collection	Activity report
	W, 18-Jul	Water quality	Water quality monitoring	Activity report
	Th, 19-Jul	Water quality monitoring technologies	Water quality testing Lab	Activity report
	F, 20-Jul	Climate change	Measuring greenhouse effect	Weekend study package
2 Developing Quantitative and analytical skill	M, 23-Jul	Math and Physics	Motion exercises	Exam 1
	T, 24-Jul	Computer applications	Computer lab	Activity report
	W, 25-Jul	Environmental data Analysis	Computer lab	Activity report
	Th, 26-Jul	Intro to Environmental Engineering	Design concept Part I	Activity report
	F, 27-Jul	Environmental Engineering design	Design concept Part II	Weekend study package
3 Mastering theoretical and Practical Application	M, 30-Jul	Capstone project	Capstone project	Exam 2
	T, 31-Jul	Capstone project	Capstone project	
	W, 1-Aug	Capstone project	Capstone project	
	Th, 2-Aug	Capstone project	Capstone project	Post Assessment
	F, 3-Aug	Student presentation		

### Required text book:

- A handout will be provided

### Required reading

- Global energy and water balance:  
[http://geography.uoregon.edu/envchange/clim\\_animations/index.html#Global%20Water%20Balance](http://geography.uoregon.edu/envchange/clim_animations/index.html#Global%20Water%20Balance)
- Boyd, C.E. (2000). Water Quality: An introduction.

3 Credits

300 level course syllabus:

Environmental Studies  
and Sustainability

## **Appendix C: Environmental Studies and Sustainability**

**Course credit: 3 (lecture)**

### **Course description**

The environmental studies and sustainability course is an interdisciplinary course designed for non-majors. It introduces students how the wellbeing of humans is integrally linked to the wellbeing of the other species with which we share the planet. The course focuses upon the fundamental principles of environment and sustainability concepts. The course content includes environmental impact, water quality, energy and water use efficiency, transportation, built environment, ecosystem services, biodiversity, climate change and green business. It will enable students to make an informed decision on their daily day activity to protect environment.

### **Course objectives**

Upon successfully completing the course, student will be able to:

- Articulate a fundamental knowledge of how human activities affect the environment or global system
- Demonstrate competence in applying basic knowledge of environmental processes and sustainability in the real world
- Demonstrate competence in articulating how the wellbeing of humans is integrally linked to the wellbeing of the other species on earth
- Demonstrate collaborative competency Articulate an intrinsic concern about the environment or conserving natural resources

### **Student Learning Outcomes**

- Define sustainable development and ecological footprint
- Describe the cause and effect of climate change
- Articulate an understanding of chemical, physical and biological processes that determine the adverse effect of environmental pollutants
- Apply green infrastructure or ecosystem services approaches to reduce the problem of urban runoff and air pollution
- Demonstrate analytical skills to evaluate how people and organizations practice sustainability through resource management, water and energy use efficiency and carbon reduction
- Describe energy use, water and food nexus
- Articulate the advantage of conserving energy towards sustainable development
- Demonstrate a self-directed approach to “green” business strategies emphasizing suppliers of ‘green’ consumers and sustainable development

## Course content

1. Intro to environment and sustainability
2. Impacts of human activities on the environment
3. Population growth and environment
4. Energy use and climate change
5. Built environment
6. Green business
7. Ecological footprint
8. Ecosystem services
9. Regulation, convention and protocols

## Course Requirement and Assessment

To accomplish the stated course objectives and student learning outcomes, students are required to attend all classes and complete one group projects. The teaching methods include, lecture, video, PowerPoint Presentation, home works and term project.

*Attendance* – Every student is expected to attend ALL classes and to be ON TIME. Students will NOT be excused early for other commitments unless previously approved by the instructor. All students are required to behave in an ethical and professional manner in class as one’s behavior may affect the other student’s learning.

*Homework* – Throughout the semester a number of problem sets will be assigned to familiarize students with some of the basic principles and methods used in environmental science and sustainability. Every student must submit all assignments on time as indicated by course instructor.

*Presentation and student led discussion* – Students will work in small groups toward a term project that will be presented during class. Small groups of students will also present and lead discussion on a topic related to the course.

*Quizzes, midterm and final examination* -

## Scoring

<u>Grade Scale (%):</u>		<u>Grade Computations:</u>	
A	90 – 100	Attendance and active class participation	5%
B	80 – 89	Home work	10%
C	70 – 79	Presentation and student led discussion	10%
D	60 – 69	Quizzes	10%
F	≤59	Midterm exam	25%
		Final Exam	40%

## Required text book

- Raven, P.H., D.M. Hassenzahl and L. Berg. 2012. Environment.

## Reading requirements

- Transportation and Sustainability Best Practices Background  
<https://www.dot.ny.gov/programs/greenlites/repository/AASHTO%20Sustainability%20Briefing%20Paper.pdf>
- Joseph Sarkis, Laura Meade and Adrien (2009). Presley Sustainability in the built environment: Factors and decision framework .  
<http://www.decisionsciences.org/Proceedings/DSI2008/docs/258-7433.pdf>
- Conventions and Protocols Relevant to Sustainable Development  
<http://www.anped.org/index.php?part=150>
- Climate change indicators  
[http://www.epa.gov/climatechange/indicators/pdfs/climate\\_indicators\\_slideshow.pdf](http://www.epa.gov/climatechange/indicators/pdfs/climate_indicators_slideshow.pdf)
- The UN Climate change information sheet  
<http://unfccc.int/resource/iuckit/cckit2001en.pdf>

4 Credits

300 level course syllabus:

Urban Water Quality  
Management

## **Appendix D: Urban water quality management**

**Course credit: 4 (lecture and lab)**

### **Course description**

This course is a team-oriented, experiential and problem based interdisciplinary course open to majors and non-majors alike. This course is designed to enhance student's competence in theoretical and practical application of urban water quality sciences and related technologies to address the urban water quality problems and management. The course content includes environmental regulation, water quality, urban runoff, data mining, information technology, dynamic interactive online course delivery, and sustainable development of interest to students from all majors. This course will be team-taught by mainly two schools (CAUSES and SEAS) in 300 level divisions for all students.

### **Course objectives**

Upon completion of the course, students will be able to:

- Demonstrate a deep understanding of factors and processes that affect urban water quality to describe the interaction of urban water system including sewer, wastewater treatment plant and urban streams/rivers.
- Demonstrate competence in laboratory analysis and field studies applicable to sustainable urban water quality management
- Apply cyber technologies, data mining to assess urban water quality status
- Articulate the role of environmental regulation and implementation of low impact development in the urban water resources management.

### **Learning outcomes**

- Define and identify sources of urban water pollutants
- Describe the impact of urban development on water quantity and water quality
- Demonstrate skill of using traditional and advance laboratory and filed technologies applied to water quality analysis
- Demonstrate proficiency in using appropriate information technology to analyze and present water quality data
- Apply data mining techniques to analyze and predict urban water quality status
- Analyze the effect of best management practices in reducing urban runoff and pollutant loads into the urban body of waters
- Articulate US clean water act and a Total Maximum Daily Load and analyze the importance of environmental policy and regulations in reducing urban runoff and enhancing urban water quality restoration.

## Course content

1. Source of pollution
2. Characterization of urban water quality
3. Water quality assessment and data mining
4. Effect of urbanization on water quantity and water quality
5. Storm water management
6. Urban green infrastructure
7. Water and wastewater treatment technologies
8. Water quality regulation

## Course requirement & Grading Criteria

To accomplish the stated course objective and student learning outcomes, each student must attend all course activities including lecture, laboratory exercises, field studies, group discussion and peer-to-peer instruction.

*Attendance* – Every student is expected to attend ALL classes and to be ON TIME. Students will NOT be excused early for other commitments unless previously approved by the instructor. All students are required to behave in an ethical and professional manner in class as one's behavior may affect the other student's learning.

*Laboratory exercise and field trips* - Students are required to participate in all lab work and sample collection from fields. Every student must write a reflective lab report for laboratory exercises and field study.

*Computer application assignments* - Students will be required to conduct quantitative analysis during a computer exercise for data quality control and quality assurance. Students will be given a group assignment and will create and make a PowerPoint presentation.

*Home work* – Throughout the semester a number of problem sets will be assigned to familiarize students with some of the basic principles and methods used in urban water quality assessment and management. Every student must submit all assignments on time as indicated by course instructor.

## Scoring

<u>Grade Scale (%):</u>		<u>Grade Computations:</u>	
A	90 – 100	Attendance and active class participation	5%
B	80 – 89	Laboratory exercises	20%
C	70 – 79	Quizzes	10%
D	60 – 69	Midterm exam	25%
F	≤59	Final Exam	40%

**Required book:**

- Ertuo, Kudret, Ilker Mirza, Daniel Marcos Bonotto and Adriana Oliveira Medeiros (Apr 30, 2010). Water Quality: Physical, Chemical and Biological Characteristics (Water Resource Planning, Development and Management Series)
- Boyd, C.E. (2000). Water Quality: An introduction

**Reading requirements**

- By Larry W. Mays, 2009. Integrated urban water management: arid and semi-arid regions. UNESCO, International Hydrological Programme, Taylor and Francies, The Netherlands
- L. A. Baker , 2010. The Water Environment of Cities
- Vladimir Novotny , 2003. Water Quality: Diffuse Pollution and Watershed Management, 2nd Edition
- Tebbutt T. H. Y. 2002. Principles of Water Quality control, Fifth Edition
- Rowney, A. C. , P. Stahre, L. A. Roesner. 1997. Sustaining Urban Water Resources in the 21st Century: Proceedings, September 7-12, Malmo, Sweden, Engineering Foundation (U. S.)
- Ertuo, K., I. Mirza, D. M. Bonotto, A. O. Medeiros, C. A. Rosa. 2010. Water Quality: Physical, Chemical and Biological Characteristics, Water Resource Planning, Development and Management Series
- Cisneros, B. J., J. B. Rose.2009. Urban Water Security: Managing Risks: UNESCO-IHP (Urban Water-Unesco-Ihp)
- Pazwash, H. 2011. Urban Storm Water Management