Proposal for Master of Environmental Engineering Program

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In consultation with
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A. Summary

The Civil, Architectural, and Environmental Engineering department at UDM is proposing the creation of a Master of Environmental Engineering program. Currently, the department offers a Master in Civil & Environmental Engineering. The splitting of the degree and the establishment of the Master of Environmental Engineering will strengthen the competitiveness of the program in terms of recruitment and enable it to grow and will more accurately reflect the degree that has been earned. The new program will have two focal areas: Water Resources and Land Management.

The establishment of this program is a natural fit for UDM. Not only would it contribute to the University’s mission to graduate individuals who make lasting, significant, and sustainable change in society, but it also is a natural extension for several strong programs in the College of Engineering & Science. Environmental engineering is a multidisciplinary field that integrates physical, chemical, and biological sciences with engineering concepts to design solutions to environmental issues. Students with a bachelor degree in engineering, chemistry, biology, architecture, or a related field may choose this program to pursue their graduate studies.

According to the US Department of Labor’s Bureau of Labor Statistics, the employment of environmental engineers is projected to grow 22 percent from 2010 to 2020, a rate faster than the average growth rate for all occupations. This increase in demand is due to several factors including the need for alternative clean energy, clean water scarcity and contamination, and expanding environmental regulations. With an aging engineering workforce, and fewer U.S. students entering the profession, the demand for environmental engineers is expected to grow. In addition, a shift in emphasis toward green design and pollution prevention is also expected to spur demand for environmental engineers. Hence, creating the Master of Environmental Engineering would increase the visibility of UDM since few universities offer a similar degree (most offer it under the civil and environmental degree), and it would attract more students to meet the demand.

In addition, countries like China, India, and Libya are becoming increasingly aware of the many serious environmental problems they face. Governments and universities in these countries are sending students to the U.S. to pursue environmental engineering degrees. UDM has already signed contracts with Nanjing University of Information Science and Technology (NUIST) and Yang Cheng Institute of Technology (YIT) to bring Chinese students for our undergraduate and graduate programs in environmental engineering. Receiving a Master of Environmental Engineering Degree is very appealing to international students and is required by many Chinese universities and companies. The proposed split of the current degree would give UDM a more competitive advantage in recruiting international students.

Graduates of the program would have the technical proficiency and analytical skills required of the field, as well as the fundamental understanding of the underlying assumptions and limitations of engineering methods when designing sustainable solutions that are sensitive to economic and social needs and address environmental concerns.

The proposed degree requires no new resources.
B. Description of the Program

B1. Catalog Description

Environmental engineering is a multidisciplinary field that integrates the principles of physical, chemical, and biological processes with engineering concepts to design solutions to environmental issues. **Master of Environmental Engineering** is a graduate degree designed for the pursuit of advanced environmental engineering studies in water and wastewater treatment, physical and chemical processes, biological unit operations, hazardous waste treatment, pollution prevention, and other environmental topics. The program is focused on developing future leaders for the engineering profession and academia. It prepares students for careers as consulting engineers, engineers in industry and government, and researchers at universities and industrial laboratories.

The proposed Master of Environmental Engineering has the following objectives:

1. Graduates of our program should work as practicing engineers/professionals.

2. Graduates of our program should create practical engineering designs and develop sustainable solutions or research projects that are sensitive to economic and social needs and address environmental, public safety, and sustainability concerns.

3. Graduates of our program should actively participate and seek leadership positions in professional societies, other worthy organizations, and their workplaces.

Admission to the program requires a bachelor’s degree in engineering or a similar field. The students should have a good knowledge of inorganic chemistry and general biology and should be proficient in physics. Applicants holding non-engineering degrees are considered for admission, but depending on their background, some students may need to fulfill pre-requisites or take engineering or math courses such as fluid dynamics, differential equations, thermodynamics, or mechanics.

The Master of Environmental Engineering, like all the graduate engineering degrees in the College of Engineering and Science, may be completed through either a thesis or a non-thesis option.
B2. Sequential Course Matrix

The thesis option includes 24 semester-credit hours of course work and 6 semester-credit hours of thesis effort for a total of 30 semester-credit hours. The thesis is a research project conducted under the supervision of a faculty member and is typically spread across two semesters. It represents an original research contribution to the field and includes a presentation (defense) of the work conducted. After a final formal presentation to the College faculty and students, a properly formatted and approved written report must be submitted.

The non-thesis option consists of 30 semester-credit hours of course work chosen according to the course requirements listed below. All courses are 3 credit-hours except when noted otherwise.

**Required General Courses: (15 credits)**
- CIVE 5860 Environmental Microbiology
- CIVE 5840 Environmental Chemistry
- CIVE 5500 Water and Waste Water
- CIVE 5830 Hazardous Waste
- CIVE 5780 Physicochemical Unit Operations

**Required Elective Courses: (9 credits)**
*Student can pick courses from one or both focal areas.*

**Water Resources Area:**
- CIVE 5866 Groundwater
- CIVE 5530 Hydraulics and Hydrology
- CIVE 5868 Water Flow Modeling

**Land Management Area:**
- CIVE 5800 Biological Unit Operations
- CIVE 5822 Soil Remediation
- CIVE 5880 Solid Waste

**General Electives: (6 credits)**
- CIVE 5630 Risk Analysis
- CIVE 5480 Advanced Soil Mechanics
- CIVE 5850 Project Management
- CIVE 5890 Earth Retention Systems
- CIVE 5510 Water and Waste Water Lab (1 cr.)
- CIVE 5910 Geographical Information Systems
- CIVE 5864 Landfill Design
A sample course matrix for the non-thesis Water Resources focal area would be:

**First Year**

<table>
<thead>
<tr>
<th>FALL</th>
<th>cr</th>
<th>WINTER</th>
<th>cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVE 5860 – Env. Microb.</td>
<td>3</td>
<td>CIVE 5840 – Env. Chem.</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 5830 – Haz. Waste</td>
<td>3</td>
<td>CIVE 5500 – Water and Wastewater</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

**Second Year**

<table>
<thead>
<tr>
<th>FALL</th>
<th>cr</th>
<th>WINTER</th>
<th>cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Elect. (CIVE 5800 – Solid Waste)</td>
<td>3</td>
<td>Required Elect. (CIVE 5530 – Hydraulics &amp; Hydrology)</td>
<td>3</td>
</tr>
<tr>
<td>General Elect. ENG 5020 – Design of Experiments</td>
<td>3</td>
<td>General Elect. (CIVE 5850 – Project Management)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
B3. List of Courses

This program is intended to be offered as a traditional program with classes during the day and in the early evenings.

The required general courses are core courses for the proposed program and introduce advanced concepts for both focal areas. These courses already exist and are being regularly offered in the department.

The required electives follow the two focal areas of the program, Water Resources and Land Management. In each of these areas, one new course needs to be designed and offered: CIVE 5868 Water Flow Modeling (Water Resources) and CIVE 5822 Soil Remediation (Land Management). Course descriptions for the new offerings are included below.

The general electives are courses regularly offered as part of the Civil and Environment Engineering (CIVE), Mechanical Engineering (MENG), General Engineering (ENGR or ENT), Chemistry department (CHM), or Business School (MBA).

A few courses will be cross-listed (*). Separate syllabi with appropriate learning outcomes will be created and reviewed by the Assistant Dean of Academic Affairs of the College of Engineering and Science.

Sample syllabi for all existing courses can be found in Appendix D.

Key:
+ : new courses
* : cross-listed courses

CIVE 5860 Environmental Microbiology (3 cr.)
CIVE 5840 Environmental Chemistry (3 cr.)
CIVE 5500 Water and Waste Water (3 cr.) *
CIVE 5510 Water and Waste Water Lab (1 cr.) *
CIVE 5830 Hazardous Waste (3 cr.)
CIVE 5780 Physicochemical Unit Operations (3 cr.)
CIVE 5866 Groundwater (3 cr.)
CIVE 5530 Hydraulics and Hydrology (3 cr.)
CIVE 5868 Water Flow Modeling (3 cr.) +
CIVE 5800 Biological Unit Operations (3 cr.)
CIVE 5822 Soil Remediation (3 cr.) + *
CIVE 5880 Solid Waste (3 cr.)
CIVE 5630 Risk Analysis (3 cr.)
CIVE 5480 Advanced Soil Mechanics (3 cr.)
CIVE 5850 Project Management (3 cr.)
CIVE 5890 Earth Retention Systems (3 cr.)
CIVE 5910 Geographical Information Systems (3 cr.)
CIVE 5864 Landfill Design (3 cr.)
CIVE 5722 Engineering Geology (3 cr.)
CIVE 5990 Thesis (6 cr.)
MENG 5810 Alternative Energy Systems (3 cr.)
ENT 5000 Introduction to Entrepreneurism (3 cr.)
ENGR 5020 Design of Experiments (3 cr.)
ENGR 5300 Advanced Engineering Math (3 cr.)
CHM 5020 Chemical Information & Safety (1 cr.)
CHM 5380 Recent Advances in Chemistry (3 cr.)
CHM 6010 Special Topics in Chemistry (3 cr.)

CIVE 5868 Water Flow Modeling

Techniques used in modeling surface or ground water flow and contaminant transport in the environment. Key topics include issues of variability and uncertainty in data and models, advantages and limitations of using models, ability to scientifically predict with reasonable certainty, and impact of modeling on decision making.

CIVE 5822 Soil Remediation

Soil contamination and remediation techniques. Key topics include sources of contamination, physical/chemical properties of chemicals, physical/chemical properties of subsurface environments, contaminant pathways and fate, design analysis, remediation techniques and evaluation, and engineering control and management of the subsurface.

B4. Additional Degree Requirements
No additional degree requirements exist for this program.

B5. Respect for Academic Integrity and Intellectual Merit

Academic Integrity:

Students will be required to follow the UDM policy on academic integrity as found in the 2013-2014 Graduate Catalog:
As members of an academic community engaged in the pursuit of truth and with a special concern for values, students must conform to a high standard of honesty and integrity in their academic work. Instances where academic misconduct occur include, but are not limited to, falsification or misrepresentation of material used in the admission process, presenting the work of other's as one's own, theft, plagiarism and cheating. These actions pose a threat to the academic integrity of the University and its mission and will be treated accordingly. Academic misconduct is subject to disciplinary sanctions. These sanctions include, but are not limited to, reprimand, probation, suspension and dismissal. Students are required to familiarize themselves with the specific protocols of their school or college, available in each respective Dean's office or Academic Policy Handbook.

Intellectual Merit:

The program currently exists under the Master of Civil and Environmental Engineering and follows the recommendation and assessment of The Higher Learning Commission (HLC), an independent commission of the North Central Association of Colleges and Schools (NCA). The Higher Learning Commission accredits degree-granting post-secondary educational institutions in the North Central region. The curriculum for the proposed degree is designed to meet the same standard already established by the department.

B6. Unique Characteristics & History

The first Civil Engineering degree was granted in 1916 at U of D. Since at least 1972, the program has had an unofficial Environmental Option of courses. In 1993, the department name was changed to Civil & Environmental Engineering and a new faculty position in Environmental Engineering was created to strengthen the graduate-level offerings by increasing the number of environmental courses taught by a full-time faculty member.

In 2011, the hiring of additional faculty members was authorized to meet future demand in students’ enrollment.

The proposed splitting of the current degree and the creation of a graduate environmental engineering degree will strengthen the program and allow for its expansion and growth to encompass more interdisciplinary areas from mechanical engineering, chemistry, and the community development graduate program in the School of Architecture.

Unique characteristics of the new program:
1. UDM will have the only graduate Environmental Engineering program located in an urban area in the State of Michigan.
2. UDM would be the only small or private school in Michigan with a graduate Environmental Engineering program.
3. The proposed program builds mostly on existing courses but develops a new niche for two focal areas of interest in environmental studies.
4. The program is designed to address the need to educate future engineers to think globally and work in a multi-disciplinary setting.

**B7. Effects on Other Programs**

There is no detrimental effect on the existing combined Master in Civil and Environmental Engineering. Graduate students in to the department are currently choosing either the Civil area or the Environmental area. Although, the number of graduating students in the Civil Engineering Master Program will show a decrease after the split compared to the current combined program, the total number of graduate students in the department is expected to increase. In fact, the creation of this degree will increase enrollment in the currently existing courses in the department since more students are expected to join the program. A surge in enrollments would be a boon to the financial performance of the CE department and the college.

Moreover, environmental students will take chemistry or mechanical engineering courses, and their presence will enrich classroom dialogue and enrollment. There may be an opportunity for environmental students to contribute to research and design projects alongside students in other disciplines (see internal support letters from Dr. Schumack, Dr.Grabowski, and Dr. Roberts-Kirchhoff – Appendix M). On the other hand, Chemistry graduate students are occasionally looking for technical electives in the environmental program, and a strengthened environmental program would better support the Chemistry graduate program.
C. Mission

C1. Program Mission
The Master of Environmental Engineering program seeks to provide a high quality, broad-based education and design experience that enable students to address multi-faceted engineering problems sensitive to environmental issues. The program seeks to provide students with the fundamental tools and skills to enable them to perform in, and evolve in, and contribute to the profession in response to changing technology and societal needs and expectations.

C2. Department Mission
The Department of Civil, Architectural & Environmental Engineering seeks to provide the highest quality of engineering education. The mission of the program is to provide a high quality, broad-based education and design experience that enables students to address complex and multi-faceted civil and environmental engineering problems.

C3. College Mission
It is our mission to serve the Detroit area, the nation, and world communities through the education of professional engineers, scientists and mathematicians, in the discovery, application, and dissemination of knowledge.

That education will be personally focused on the needs of each student, value centered in the tradition of the Catholic Church, affordable, and unexcelled in quality of instruction and content. It will be characterized by a hands-on nature, which will include frequent laboratory experiences and an integrated cooperative experience for all students. It will be convenient to all students, whether full-time or part-time, on-campus or off-campus.

The College will discover and apply knowledge, which effectively addresses the critical opportunities and challenges of the urban and industrial communities. It will do so through active and intimate partnerships with industry and government.

We will be helpful, courteous, and professional in all internal and external interactions.
C4. Fulfillment of College and Department Missions

Environmental issues are a particular concern in the City of Detroit which has many residential areas with polluted land, abandoned factories with industrial contamination, and an aging water distribution system. The program mission ties in well with the College mission in its goal to “discover and apply knowledge, which effectively addresses the critical opportunities and challenges of the urban and industrial communities.” The mission of the program is also consistent with that of the College and Department in their focus on quality education and design experience. Combining theory and practice enables students to address multi-faceted environmental engineering problems and respond to changing technology and societal needs.

C5. Fulfillment of University Mission

“Excellent student centered undergraduate and graduate education” is at the core of UDM’s mission. The proposed program is designed to reflect the current environmental challenges and the changing societal needs and also to train the students to think globally and work in a multi-disciplinary setting. The program objectives are focused on developing future leaders for the engineering profession and academia. Thus, this proposal strongly reflects the mission of providing excellent student-centered education that is both current and relevant.

Moreover, the mission of this program addresses not only the need to be educated in the professional discipline but also addresses the need to serve humankind. Educating engineers that create practical design, develop sustainable solutions, and address public safety to help promote sustainability, environmental responsibility, and population health strongly ties to the fundamental values of the Jesuit and Mercy traditions.
D. Market and Need

D1. Market Study

Demand for the New Program:

According to the US Department of Labor’s Bureau of Labor Statistics, the employment of environmental engineers is projected to grow 22 percent from 2010 to 2020, a rate faster than the average growth rate for all occupations. The increased demand for environmental engineers is due to several factors including the need to treat contaminated water in areas of the country where drilling for shale gas requires the use and disposal of massive volumes of water, the continued request to improve the technology of alternative clean energy, the decaying water and sewer distribution infrastructure, and the mandate to comply with increasing and expanding environmental regulations to deal with pollution control and mitigation.

With fewer U.S. citizens entering the profession and an aging engineering workforce, the demand for environmental engineers is expected to grow. In addition, a shift in emphasis toward green design and pollution prevention is also expected to spur demand for environmental engineers.

With its emerging economy, China is becoming more aware of its environmental problems. UDM has already signed contracts with Nanjing University of Information Science and Technology (NUIST) and Yang Cheng Institute of Technology (YIT) to bring Chinese students to study environmental engineering. The contract with Nanjing is a 2 + 2 program for undergraduates in which the students study in China for the first 2 years in China and then come to UDM to finish the last two years. Of the nine currently enrolled students, six have already committed to continue for the graduate environmental program. Yang Cheng contract is a 3+1+1 program, also called a 3 + 2 program. The students are expected to spend the first three years in China then one year at UDM to complete their bachelor’s degree, and then another intensive year here to finish the graduate environmental degree. Another agreement with Beijing University of Chemical Technology (BUCT) is underway. The University is actively working to enact another recruiting program with BUCT.

Please see Appendix M6: Additional Information on why Chinese universities are interested in environmental engineering.
The Libyan government, realizing the need to educate engineers in the environmental field, is sending graduate students with full scholarship to the U.S. Many students have come to the graduate program in environmental engineering at UDM.

Biology and Chemistry students at UDM who do not wish to continue in the health profession may be interested in a graduate environmental engineering degree and thus seek enrollment in the program. Similarly, architectural or mechanical engineering students interested in green design, clean energy, sustainable solutions, and waste disposal may consider a graduate engineering degree in environmental studies.

The proposed program will be the only graduate Environmental Engineering program located in a small private school and in an urban area in the State of Michigan, so it is expected that the program will draw students from the region who are interested in a private urban education.

As it can be seen, there could be a demand for the program locally, regionally, nation-wide, and internationally.

Students Recruitment:

Recently, the College of Engineering and Science has hired a program recruiting coordinator to develop new strategies for recruitment of undergraduate and graduate students at the local and national levels.

At the international level, Dr. Lin, the UDM recruiter for China, will heavily recruit for direct transfers into the Masters program. We will always seek any opportunity to expand our student recruitment to other Chinese universities.

The College is also in the process of planning to propose advertising in Libya, where many graduate students have enrolled at UDM for the environmental program in the past few years.

Enrollment Estimates:

For the past few years, the graduate enrollment of the department averaged a total of 11 students (3 domestic and 8 international). By creating this degree and advertising it in-house and to local and regional universities, we can cautiously estimate a continuous 25 – 50% growth in the student population region wide.

The first cohort of students who came from NUIST will finish their Bachelors degree this spring and 6 students have already committed to continue their graduate studies in Environmental engineering at UDM, next year. Our contract with YIT stipulates an enrollment of 30 undergraduate students in the Fall 2013 in China. They will finish the first 3 years in China and come to the Civil and Environmental department at UDM in fall 2016 for their senior year and master degree. They will enroll in the
graduate program in 2017. A conservative estimate will assume only 15 students continuing in the Masters program.
If the Libyan and international (non-Chinese) graduate student population continues to enroll at the same rate, the number of students could be conservatively estimated to increase by 1-2 per year.

Master students take an average of nine credits per term. This would provide 810 credit hours in the first year, and more in following years due to students taking multiple years to complete the program.

Table D1. Projected Enrollment of Environmental Engineering Masters Students*

<table>
<thead>
<tr>
<th></th>
<th>AY 2014</th>
<th>AY 2015</th>
<th>AY 2016</th>
<th>AY 2017</th>
<th>AY 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Enrollment</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Intern. (Non-Chinese) Enrollment</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Chinese Enrollment</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Total Enrollment</td>
<td>18</td>
<td>18</td>
<td>21</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>Credit Hours</td>
<td>324</td>
<td>324</td>
<td>378</td>
<td>522</td>
<td>540</td>
</tr>
<tr>
<td>Tuition (in current dollars)</td>
<td>$456,840</td>
<td>$456,840</td>
<td>$532,980</td>
<td>$736,020</td>
<td>$761,400</td>
</tr>
</tbody>
</table>

*Assuming no institutional aid

D2. Competition

The following universities in Michigan have Environmental Engineering degrees distinct from CE:
- University of Michigan—Ann Arbor
- Michigan State University
- Michigan Technological University

These universities are large research universities and are not located in the Detroit Metropolitan area. Other universities such as Wayne State and LTU have a Civil Engineering degree but only offer a focal area in Environmental Engineering.

Enrollment in competing universities was provided from the 2012 ASEE Edition of the
Profiles of Engineering & Engineering Technology Colleges. It is a yearly publication of the American Society of Engineering Education (ASEE) and lists the number of degrees awarded in the different engineering fields. This directory provides detailed profiles of U.S. and Canadian schools offering undergraduate and graduate engineering, as well as engineering technology programs.

Master’s degrees awarded in Environmental Engineering, 2011-2012

<table>
<thead>
<tr>
<th>University of Michigan—Ann Arbor</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan State University</td>
<td>4</td>
</tr>
<tr>
<td>Michigan Technological University</td>
<td>12</td>
</tr>
</tbody>
</table>

D3. Job Market

According to the Occupational Outlook Handbook, (http://stats.bls.gov/ooh/architecture-and-engineering/environmental-engineers.htm#tab-6) in the US, employment of environmental engineers is expected to grow much faster than the average through 2020. An estimated 11,300 new environmental engineering jobs will be created by 2020.

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Engineers</td>
<td>17-2081</td>
<td>51,400</td>
<td>62,700</td>
<td>22</td>
<td>11,300</td>
<td>[XLS]</td>
</tr>
</tbody>
</table>


A simple search on Sept 10th, 2013, in careerbuilder.com website for “environmental engineer” revealed 2,599 jobs posted with title and description in the U.S. alone. With very few
universities offering a graduate degree in environmental engineering in our region, competition is minimal. Attracting significant amount of market share (in a market that is likely to grow in the US) will not be very difficult.

D4. Partners

There are several potential partners who could be helpful in making this effort successful. The college advisory board is made of alumni who are in top positions in their own fields and therefore would be a tremendous resource. Other active alumni, especially those from the Civil and Environmental program would be valuable in this effort as well. Dr. Lin, the University recruiter in China, has contact with numerous universities who are interested to send students for the program as long as the need to remediate environmental contamination and prevent pollution persists in that part of the world.

D5. Uniqueness

1. UDM will have the only graduate Environmental Engineering program located in an urban area in the State of Michigan.
2. UDM would be the only small or private school in Michigan with a graduate Environmental Engineering program.
3. The proposed program builds mostly on existing courses but develops a new niche for two focal areas of specializations in the environmental studies.
4. The program is designed to attract student with different educational background and to address the need to educate future engineers to think globally and work in a multi-disciplinary setting.
E. Objectives, Learning Outcomes, and Assessment

E1. Program Educational Objectives

The program education objectives are:

1. Graduates of our program should work as practicing engineers/professionals.
2. Graduates of our program should create practical engineering designs, solutions or research that is sensitive to economic and social context, and community needs, and addresses environmental, public safety and sustainability concerns.
3. Graduates of our program should actively participate and seek leadership positions in professional societies, other worthy organizations and their workplaces.

E2. Learning Outcomes

When graduating from the program, students will be able to:

a) Apply knowledge in earth sciences to the design of landfills.
b) Apply knowledge in fluid flow and water sciences to surface and ground water systems.
c) Apply the principles of physical, chemical and biological processes to the treatment of water, waste water and unit operations.
d) Apply the principles of physical, chemical and biological processes to the treatment and management of hazardous and solid waste.
e) Apply sustainability principles to the design of environmental systems.
f) Design and implement intelligent engineered solutions to mitigate challenging environmental problems or meet specific human needs.
g) Develop innovative approaches and an entrepreneurial mind set.
h) Identify the importance of professional development and engagement in a life-long learning.
i) Identify the importance of being an active stakeholder and the engagement in planning and policy-making.
E3. Assessment of Learning Outcomes and Objectives

The proposed program will comply with the assessment guidelines followed at UDM and within the College of Engineering & Science. The requirements followed for assessing the current combined degree (Civil and Environmental Eng.) described in this section will be replicated for the proposed split degree.

The proposed program will also be accredited by the Higher Learning Commission (HLC) which is an independent corporation and a member of the North Central Association of Colleges and Schools (NCA).

The process used to evaluate/review objectives and assess outcomes is shown in the figure below. The process consists of two cycles: a three-year cycle in which program educational objectives are reviewed and evaluated and an annual cycle in which program outcomes are assessed. The evaluation of the relevance of the objectives is determined by using feedback from constituencies through electronic alumni survey, electronic student survey, and advisory council meetings. The annual cycle assesses each of the program outcomes using a variety of tools and reporting mechanism including but not limited to exams, presentations, quizzes, homework, projects, term papers, students survey…

The proposed program will have for the time being the same advisory board committee that oversees the combined current degree, however, a new advisory committee with members from the environmental engineering field will be formed in the future. A list of our current advisory council is shown in the table below.

Assessment of Program Educational Objectives:

Every three years a report is written on the program education objectives. This report follows the guidelines of HCL.

Assessment of Learning Outcomes:

For the graduate program, a course worksheet where program outcome are assessed is written after every offering. All assessment worksheets pertaining to the same outcome are then compiled to create a yearly learning outcome binder.

Please refer to the curriculum matrix in Appendix B that shows how the assessment methods correspond to the learning outcomes and the program objectives.
Figure 1. General process-Three years cycle

Figure 2. Program Outcome Assessment

Figure 3. Program Educational Objectives and Outcomes Evaluation Process
<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kevin Olmstead</td>
<td>TetraTech</td>
</tr>
<tr>
<td>Engineer</td>
<td>Ann Arbor, Michigan</td>
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<tr>
<td>Jesse Vandecreek, P.E. Associate</td>
<td>HRC Inc.</td>
</tr>
<tr>
<td></td>
<td>Bloomfield Hills, Michigan</td>
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<tr>
<td>Greg Johnson, P.E.</td>
<td>Michigan Department of Transportation,</td>
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<tr>
<td>Deputy Director</td>
<td>Southfield, Michigan</td>
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<tr>
<td>Dr. Aldo Colandrea, P.E. Principal</td>
<td>Consultant</td>
</tr>
<tr>
<td>Engineering</td>
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<td>John Linenberg, Engineering Manager</td>
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<td>Douglas Zande, Retired</td>
<td>US Army Corp of Engineers</td>
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<td>William Gruebna, Retired</td>
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<td>HRC Inc.</td>
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<td>Evans Bantios</td>
<td>Testing Engineers &amp; Consultants, Inc</td>
</tr>
<tr>
<td>Paul H. Gluszak, P.E.</td>
<td>Wayne County</td>
</tr>
<tr>
<td>Division Testing Engineer</td>
<td>Michigan</td>
</tr>
</tbody>
</table>
F. Students

F1. Targeted Student

The College of Engineering & Science does not admit those who, in its judgment, do not have the background to succeed in its academically demanding programs. Therefore, the students admitted to this program will match the high quality of academic preparation found in most engineering students.

As previously discussed, the program will attract U.S. and international students. Primarily, full-time students will be recruited. However, this is a graduate program and therefore it will also admit part-time, nontraditional, or industry partners as long as they can meet the challenging demands and the expected outcomes of the program courses.

Currently, students in the Master of Civil & Environmental Engineering program come from around the world. Countries currently represented include: the U.S., India, China & Taiwan, Libya, Syria, and Nigeria.

F2. Existing Student Enrollment Impact

After earning their Bachelor degree, students from Civil Engineering, Mechanical Engineering, Chemistry and Biochemistry, Biology, or Architectural Engineering who are interested in clean energy, green design, sustainable solutions, may be drawn to pursue a graduate degree in Environmental Engineering. Moreover, the future development of an environmental science minor will act as a conduit that feeds adequately prepared students into the program. The creation of this degree will attract this niche of future environmental students who otherwise would not have continued here.

As it was previously stated in section B7, the graduate Civil & Environmental Engineering program will not be negatively impacted by the establishment of this degree. The degree conferred will change, and because of that, enrollment will increase in the currently under-enrolled existing courses of the department and the college, since more students are expected to enroll.

The program is expected to attract new students locally, regionally, nationally, and internationally. The University has a current mechanism in place to meet the needs of the admitted students. We do not foresee any additional needs not fulfilled beyond this.
F3. Attracting Diverse Students

**Gender diversity:**

The Engineering programs at UDM have a far better representation of female students compared to the national average (22% vs. 18%).

According to the National Science Foundation ([www.nsf.gov](http://www.nsf.gov)), women have higher college graduation rates compared to men, overall. However, men disproportionately outnumber women in the number of Science and Engineering (STEM) degrees received. A study in the Society of Women Engineers, in March 2012, ([http://societyofwomenengineers.swe.org/](http://societyofwomenengineers.swe.org/)) indicated that women were employed in higher rates than men in the environmental engineering field.

Since women are attracted to environmental studies, a Master of Environmental Engineering program would help to even further decrease the gender gap in engineering at UDM.

**Racial diversity:**

The Engineering programs at UDM have an excellent representation of underrepresented minority students compared to the national average (24% vs. 13%). Being located in Detroit, the program can market to and recruit minority students.

There is a possibility of attracting a large number of U.S. students into this program locally and nationwide once the Master’s degree is created (please refer to section D1). In addition, the program will be marketed in China, and potentially in Libya.

The goal of the proposed program is to attract a diverse and vibrant student body. The College has plans to develop summer camps in Environmental Science and Engineering to help increase awareness and build interest in programs like this.

F4. Is this Program an Expansion of an existing Program?

The establishment of the Master in Environmental Engineering will result in an expansion of the current Civil and Environmental Engineering program. More students are expected to enroll under the new degree.

The number of student majors and the number of degrees awarded for the past five years are shown in the table below.
## Master of Civil & Environmental Engineering

<table>
<thead>
<tr>
<th></th>
<th>FYE 09</th>
<th>FYE 10</th>
<th>FYE 11</th>
<th>FYE 12</th>
<th>FYE 13</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Majors</strong></td>
<td>13</td>
<td>9</td>
<td>9</td>
<td>12</td>
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<tr>
<td><strong>Degrees conferred</strong></td>
<td>4</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>8</td>
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</tbody>
</table>

The College has plans to develop summer camp in Environmental Science and Engineering to help increase awareness and build interest in this program.

The College is working to hire a graduate recruiter this fall. The recruiter can contact employers and reach out to large companies to send their employees for further studies in environmental engineering.
G. Faculty

G1. Faculty List

Below is a list of the current faculty:

Full time faculty from the CE department
- Alexa Rihana, PhD (Teaching, advising, coordinating placements)
- James Lynch, PhD (Teaching)
- Utpal Dutta, PhD (Teaching, advising)
- Alan Hoback, ScD (Teaching, advising, coordinating placements)

Part time faculty from the CE department
- Purushottam Deo, Ph.D. (Teaching)
- Jeffrey H. Bednar, PE, CFM (Teaching)

Full time faculty from the College of Engineering
- Jonathan Weaver, Ph.D. (Teaching)
- Mark Schumack, Ph.D. (Teaching)
- Nassif Rayess, Ph.D. (Teaching)
- Nart Shawash, Ph.D. (Teaching)

Currently, all listed faculty teach the required and elective environmental courses as part of their regular teaching loads. Dr. Deo teaches Groundwater, and Mr. Bednar teaches Hydraulics and Hydrology. Electives are offered based on need and availability. As this point, the two new courses in the program will be taught by part time faculty when needed.

G2. New Faculty Staffing

At this point there are no plans to hire new faculty members. However, if enrollment justifies building instructional capacity, the program would strive to recruit faculty based on experience and credentials, and will follow UDM requirements and recommendations for encouraging diverse prospective faculty members to apply to UDM.

If enrollment exceeds 25, two part-time positions will be created. These positions can become full time if the enrollment becomes sustainable. The new faculty will be specialized in computational modeling of water flow and sustainable energy system.
H. Administration and Support

H1. Administration

The environmental degree will be housed in the department of Civil, Architectural & Environmental Engineering and administered by the senior environmental faculty (Alexa Rihana) in consultation with the department chair (office held by Alan Hoback). The faculty teaching the Environmental courses will be formed into a program assessment committee.

H2. New Support Personnel

No new support personnel are required.
Secretarial: None needed.
Lab support: None needed.
Current staffing is satisfactory.

H3. New Support Personnel-IT

The Environmental Engineering students will use the existing IT infrastructure.

H4. New Remedial and Coop Personnel

It is not anticipated that remedial work will be required at the graduate level.
I. Library/IDS Resources

I1. Current Resources

The library now receives the most relevant periodical publication:

*Environmental Engineering*
*Water Environment Research*
*Environment. (free online)*
*Water engineering & management*
*Journal of water resources planning and management. (ASCE)*
*Journal of Geotechnical and Geoenvironmental Engineering (ASCE)*
*Advances in Environmental Sciences and Technology (1971-1994)*

Needed Library Funding:

At this time, no additional investment in library resources is needed. The above list of periodical publication available in the library is more than adequate to support the program.

For the next five years, provided the enrollment numbers hold as predicted, the program will subscribe to additional journal in computational modeling and clean energy and other sustainable engineering periodicals. Although these journals are relevant to the program, they are not absolutely necessary to the establishment of the degree since we already have an extensive collection.

At this moment no new resources are needed.

I2. On-line Resources

NA
J. Facilities

J1. Facilities

Current Facilities

Office space and Classroom space:

- Current faculty offices and classrooms are adequate.

Lab space and Computer lab space:

- Environmental and Soil Labs are upgraded and adequate, as well as the Computer lab.

Anticipated Facilities

Office space and Classroom space:

- In the next 5 years, if student enrollment increases to warrant the hiring of a full time faculty, the engineering building can accommodate a new faculty office. Part time faculty members share a designated office space adequate for their needs.

- In the next 5 years, the classrooms in which courses are held have capacity to seat new students. If enrollment exceeds 30 students, we contacted the Registrar and have been informed that we may run into space issues if the program courses “need to be taught at specific times and days when we are already at maximum classroom capacity, such as 10-10:50 and 11:00-11:50 MWF or TR 11:20-12:35.”

Most of the graduate classes are offered in the afternoon (1:00 – 5:00 pm) or early evenings (5:00 – 9:00 pm). Jeff Nardecchia, the classroom scheduler, reported that the large classrooms in the Life Science Building are not used much in the afternoons while the biology labs are being run, so these rooms can be used for large enrollment lectures if needed.

Lab space and Computer lab space:

- Engineering labs currently have capacity for more students. Also, multiple sections of many laboratory classes can be offered to accommodate increasing student numbers.
J2. Registrar concerns

At this point, no facility need is anticipated.

J3. New Facility Costs

None of these would be necessary at this point.

J4. IT Resources Estimate Costs

NA
K. External Support

K1. Accreditation Available

The proposed program will be accredited by the Higher Learning Commission (HLC) which is an independent corporation and a member of the North Central Association of Colleges and Schools (NCA).

K2. External Review

None sought.

K3. External Funding

The Department of Civil and Environmental Engineering has been successful in securing external funds to support various departmental needs. The Engineering Centennial Fund established by external sources including alumni and firms committed $25,000 for the Environmental lab renovation. The renovation was completed and the lab was upgraded. Additionally, ANR Pipeline has previously donated $10,000 to support the environmental lab.

The Department will continue to look for opportunities to seek external support and identify sources for funding that would enhance the Environmental Engineering Program.
L. Operating Revenue and Costs

L1, L2, L3, L4. Budget

Since the proposed degree is a split of the current one, no new resources are needed.

Notes:

- The tuition is based on current 2013-2014 rates which is $1,410 per credit hour. The tuition revenue was estimated in a conservative manner and no tuition increase was assumed over time.

- No institutional aid was assumed in this study.

- The operating cost of the laboratory that includes parts and supplies needed to keep the lab running are not included in the first four years of the program since there is a special lab equipment fund that will be used to buy all the necessary supplies during that time period. After that $2000 will be budgeted for lab expendables.

L5. Resources Allocation

No new resources are needed at this time to start the program, so no resources will be reallocated from existing programs. Current distribution of resources will be maintained in the Department of Civil and Environmental Engineering.
M. Approval Process
M1. College Curriculum Committee
September 19, 2013

RE: Approval of M. EnvE by E&S

To Whom it may concern:

The Engineering & Science Curriculum & Standards Committee has approved the Master of Environmental Engineering program proposal.

Environmental Engineering is an area with growing demand across the US and the world. Approval of the program will result in a tremendous economic boost to the University through enrollment of students from UDM’s contract partners in China. This should also result in greater marketability of the program in the US.

The committee finds that since the program is currently being offered under the more expansive Master’s degree, that there is very likely no additional cost that would be incurred by the University. However, marketing the new program and providing other resources could benefit the University with increased exposure to US students.

The committee finds that the related programs in the college are models of program assessment. Therefore, the assessment processes of this program will become refined through continuous improvement.

Sincerely,

[Signature]

Dr. Alan Hoback
Chair, E&S Curriculum & Standards Committee
M2. University Support
None sought.

M3. Internal Support Letter
- Mark Schumack (Mechanical Engineering)
- Liz Roberts-Kirchhoff (Chemistry)
- Greg Grabowski (Biology)
- Gary Kuleck (Dean of Engineering and Science)

M4. External Support Letter
- Mr. Robert B Hamilton, P.E., Chairman/CEO, Gewalt Hamilton Associates, Inc., Illinois Civil Engineer of the Year.
- Mr. Jesse B. VanDeCreek, P.E., Associate, Hubbell, Roth & Clark, Inc.

M5. University Budget Review

M6. Additional Information

Why Chinese universities are interested in environmental engineering?

China’s new "middle class" environmental protests
Liu Jianqiang
02.01.2013

Most of the large cases of disorder seen in China over the last five years have been sparked by pollution issues. Liu Jianqiang asks why environmental protection has failed.
Environmental issues are driving China's urban middle-class to the streets in protest (Image by Global Voices)

China’s urban residents (or the new “middle class”) protest on the streets only very rarely. Discontent is expressed almost exclusively online, via angry typing. But this has changed over the last five years – protests have come offline and onto the streets.

2012 saw popular protests in Ningbo, Shifang and Qidong. There have been widespread demonstrations over the last five years: against a PX plant in Dalian; against waste incinerators almost everywhere; against another PX plant in Xiamen, in the form of a mass “stroll”; against high speed rail in Shanghai, in the form of a mass “shop”; against the Liulitun incinerator in Beijing, when locals picketed the State Environmental Protection Agency.

Chinese citizens are taking to the streets again and again, with a new protest arising as soon as the last is resolved.
## Appendix A: Budget

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>AY2014</th>
<th>AY2015</th>
<th>AY2016</th>
<th>AY2017</th>
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<td>Tools Maintenance/Repair</td>
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<td>$550</td>
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<tr>
<td>Library</td>
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<td>Marketing/Advertising</td>
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<td>$456,840</td>
<td>$532,980</td>
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<td>Net Revenue</td>
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<td>$530,380</td>
<td>$733,120</td>
<td>$758,300</td>
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</table>
Appendix B: Curriculum Matrix

Required courses will be used for assessment purposes.

<table>
<thead>
<tr>
<th>Program Objective</th>
<th>Learning Outcome</th>
<th>Course</th>
<th>Exams</th>
<th>Projects</th>
<th>Papers</th>
<th>External Evaluators</th>
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<td><strong>Objective 1</strong></td>
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<tr>
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<tr>
<td><strong>Objective 3</strong>&lt;br&gt;Seek leadership positions</td>
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<tr>
<td><strong>Outcome i</strong></td>
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<td>CIVE 5880</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
The table below shows how every course (required or electives) is linked to the learning outcomes and program objective.

<table>
<thead>
<tr>
<th>Program Objective</th>
<th>Learning Outcome</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work as practicing engineers/professionals</td>
<td><strong>Outcome e</strong></td>
<td>CIVE 5780, CIVE 5864, CIVE 5500, ENGR 5020</td>
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<tr>
<td></td>
<td><strong>Outcome f</strong></td>
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</tr>
<tr>
<td></td>
<td><strong>Outcome g</strong></td>
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<tr>
<td><strong>Objective 2</strong></td>
<td></td>
<td></td>
</tr>
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<td>Create practical design, sustainable solutions</td>
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<td><strong>Outcome g</strong></td>
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</tr>
</tbody>
</table>
Learning Outcomes

When graduating from the program, students will be able to:

a) Apply knowledge in earth sciences to the design of landfills and waste storage.
b) Apply knowledge in fluid flow and water sciences to surface and ground water systems.
c) Apply the principles of physical, chemical and biological processes to the treatment of water, waste water and unit operations.
d) Apply the principles of physical, chemical and biological processes to the treatment and management of hazardous and solid waste.
e) Apply sustainability principles to the design of environmental systems.
f) Design and implement intelligent engineered solutions to mitigate challenging environmental problems or meet specific human needs.
g) Develop innovative approaches and an entrepreneurial mind set.
h) Identify the importance of professional development and engagement in a life-long learning.
i) Identify the importance of being an active stakeholder and the engagement in planning and policy-making.
Appendix C: Documentation of Support

**Internal Letters:**

Dr. Gary Kuleck, Dean, College of Engineering and Science  
Dr. Mark Schumack, Professor, Mechanical Engineering  
Dr. Gregory Grabowski, Chair, Biology  
Dr. Elizabeth Roberts-Kirchhoff, Associate Professor, Chemistry and Biochemistry

**External Letters:**

Mr. Robert B Hamilton, P.E., Chairman/CEO, Gewalt Hamilton Associates, Inc.,  
Illinois Civil Engineer of the Year.  
Mr. Jesse B. VanDeCreek, P.E., Associate, Hubbell, Roth & Clark, Inc.
Dear Dr. Rihana,

I strongly endorse the Master’s of Environmental Engineering Program as a vital part of providing high quality and in-demand engineering degrees that prepare our students for the professional world. According to the U.S. Bureau of Labor Statistics, employment of environmental engineers is projected to grow 22 percent from 2010 to 2020, faster than the average for all occupations. Employers at the local, state and national levels will need talented environmental engineers to solve many pressing problems including monitoring and improving water and air quality, enhancing and improving recycling and waste disposal and many other issues which impact public health and safety. Environmental engineers also participate in the development of a city’s infrastructure including the safe design of parks and public areas, and ensuring that new construction does minimal damage to natural and urban habitats as well as providing the expertise to design products that do minimal damage to the environment. With this program, we are perfectly positioned to provide the education and training to prepare students to enter into these demanding and rewarding professions.

The demand for environmental engineering in international markets such as China are even more pressing. The challenges that Chinese environmental engineers face are daunting and the Chinese look to American universities to provide the training for their environmental engineers to seek solutions when they return. We have multi-year contracts with several Chinese institutions to bring students here for a master’s degree in environmental engineering and are in negotiation with other universities. This demand is likely to continue unabated and probably grow in the years to come.

Finally, this program is vital as we continue the development of an environmental program across the College which will ultimately encompass engineering and the sciences. As I continue to meet with prominent alumni and discuss the future of the College and strategic directions that will sustain us into our 2nd century, the environmental theme resonates strongly and this Master’s of Environmental Engineering Program is the central foundation to continue on this path. We are working to hire a graduate recruiter in the College this Fall which will benefit this program and I will provide all of the support that I can possibly provide to see its success.

Sincerely,

Gary Kuleck, Ph.D.
Dean, College of Science and Engineering
September 10, 2013

Dear Committee Members:

I would like to lend my enthusiastic support to the proposal for a Master of Environmental Engineering program at UDM. I believe that such a program, which is an increasingly popular choice for students interested in engineering, would be a perfect fit for UDM. Not only would it contribute to the University’s mission to produce graduates that make lasting, significant, and sustainable change in society, but it is a natural extension of several strengths in the College of Engineering & Science.

For several years now I have taught a well-enrolled engineering course entitled *Alternative Energy Systems*. Although much of the course material deals with mechanical systems, there is a strong tie between the design of alternative energy production systems and the drive to alleviate the environmental concerns with pollution from coal- and natural gas-burning plants. Environmental engineers are commonly called on to predict the CO$_2$-reducing impact of wind, solar, and other “green” technologies. I look forward to Environmental Engineering students enriching classroom dialogue in this course, and perhaps contributing to research and design projects alongside students in Mechanical Engineering.

Another benefit of UDM starting a Master of Environmental Engineering program is that women – historically underrepresented in engineering – are more attracted to Environmental Engineering than other engineering disciplines. Although Mechanical Engineering and Electrical Engineering enroll among the lowest percentage of women on a national basis, UDM typically enrolls higher percentages of women in these fields. A Master of Environmental Engineering program would help to even further decrease the gender gap in engineering at UDM.

Sincerely,

Mark Schumack, Ph.D.
Professor of Mechanical Engineering
Dear Committee Members,

As chair of the Biology department I am happy to recommend the inclusion of the Masters of Environmental Engineering into the number of graduate programs offered by the University of Detroit Mercy. Approximately one third of incoming freshmen enter the science departments every year, with a majority entering my department. As freshmen they initially limit themselves to health related professions; however, as they progress through their academics their professional interests expand. This Master’s degree offers a tremendous opportunity for students as they explore post graduate options, and realize the professional diversity the biology degree offers. Within the biology degree, my department has collaborated on the Bioinformatics Minor and is currently developing an Applied Genetics Concentration. These programs were developed in an effort to diversity our degree and provide students with alternatives to the health professions. The proposed Masters of Environmental Engineering will offer yet another alternative for our students, with the added benefit of retaining UDM undergraduates as UDM graduate students. Most recently civil engineering and science faculty were tasked with the development of an Environment Minor offered to all UDM students. Once this minor is in place the added opportunities of the Masters of Environment Engineering are significantly enhanced. Initially Biology majors not pursuing careers in health will benefit from this Master’s degree and provided internal candidates in additional to those entering from other institutions. With the development of the Environmental Minor, the UDM student pool staying at UDM for their graduate professional degree in Environmental Engineering is greatly expanded.

The Masters of Environmental Engineering is a benefit to my department and its students, allowing them to continue their education in a similar fashion at UDM as those entering the Physician Assistant and Dental Schools. This Master’s degree also provides an academic landmark for UDM students earning an Environmental Minor, and provides the backbone for future environmental programs offered at UDM. The academic impact of this Master’s degree goes well beyond the Civil Engineer department, effecting enrollment opportunities in the sciences and the entire University. With the excellent reputation of the Civil Engineering department, the acceptance of this program most assuredly will enhance the reputation of the University of Detroit Mercy on an international level.

Sincerely,

Gregory M. Grabowski, MS, PhD
Chair of Biology, Professor
September 12, 2013

Dear Committee Members:

I support the establishment of a Master of Environmental Engineering program in the College of Engineering and Science at UDM. Environmental engineering is an interdisciplinary field that integrates both science and engineering. This degree would be appealing to undergraduate students from both engineering programs and science programs including our students in the Department of Chemistry and Biochemistry. Many of our students (especially those pursuing chemistry degrees) enter a graduate program after earning their undergraduate degree. A Master’s degree in Environmental Engineering would enable our students to solve environmental problems using their backgrounds in biology and chemistry. Creating this opportunity for the students in our department would allow them to complete this graduate degree at UDM rather than looking elsewhere.

In addition, some of the courses offered for this degree program would give opportunities for our master’s students in chemistry to interact with the students in this program. One or more courses in our department (i.e. Special Topics in Chemistry: Environmental Chemistry, Chemical Information and Safety, or Recent Advances in Chemistry) could be offered as technical electives in the environmental engineering program just as some of the environmental engineering courses would be engaging technical electives for our students in the MS chemistry degree program.

Sincerely,

Elizabeth Roberts-Kirchhoff

Elizabeth Roberts-Kirchhoff, Ph.D.
Associate Professor of Chemistry and Biochemistry
September 25, 2013

Gary Kuleck, Ph.D.
Dean, College of Engineering and Science
University of Detroit Mercy
4001 McNichols Road
Detroit, MI 48221

Re: Master of Environmental Engineering,
Support for Independent Program

Dear Dr. Kuleck:

Gewalt Hamilton Associates, Inc. is a Civil Engineering consulting firm providing services to governmental agencies and major institutions in the Midwest, with particular geographic focus on Northeastern Illinois. Our firm has grown to a staff of over 80 and provides services in municipal engineering, highway/traffic engineering, surveying, and construction phase services.

Several years ago, we identified a growing demand for environmental services, particularly those involving jurisdictional wetlands and stormwater quality management. As a result, we have added environmental services to our offerings and have built a small department serving this need; and it has worked out quite well. Today, the Department has three professional staff and several support technicians, and we plan to add more as we continue to grow. Their workload is strong and varied and prospects for growth are excellent.

As an aside, several years ago, GHA also decided to actively increase minorities and women on our professional staff and in our leadership positions. This has been quite successful, with seven of the last professional hires being women. Interestingly, all three of our last hires in our Environmental Section have been women. I don’t know if this is a consistent trend in female enrollment, but it has been consistent here at GHA. As a possible basis for this direction, I have a MSCE with an environmental concentration from the University of Illinois, and saw this service expansion as a major opportunity with strong positives for us with our client communities.

With the population growth in our municipalities, an increase in urban density in many cities, and the likelihood of increasingly stringent national storm-water and drinking water quality requirements, the potential for the strong growth in this is quite high.

Based on our assessment of the demand for these professional services in both the present and the future, I do support the proposed program and I am confident that this proposed program will graduate quality engineers who will serve both our profession and our community.

I urge the University of Detroit Mercy to consider developing a dedicated degree program for the Master of Environmental Engineering. Please call or email any questions.

Sincerely,

Robert B Hamilton, P.E.
Chairman / CEO

cc: Dr. Alexa Rihana Abdallah
October 4, 2013

University of Detroit Mercy
Engineering Building E262
Detroit, Michigan 48221-3038

Attn: Dr. Alan Hoback, P.E.

Re: Master of Environmental Engineering
Letter of Support

Dear Dr. Hoback:

I am a 1993 graduate of the University of Detroit with a bachelor of science in Civil Engineering. My first assignment as a graduate engineer was on the Rouge River National Wet Weather Demonstration Project. My goal was to design combined storm and sanitary sewer collection systems to eliminate combined sewer overflows into the Rouge River during wet weather events. What began for me as a hydraulic design assignment has evolved into a fulfilling career of being responsible for the planning, design and construction of numerous pollution control programs and drinking water treatment facilities across the State of Michigan.

I can personally attest to the high demand in the civil engineering profession for graduate engineers with an environmental focus and I fully support the creation of a Master of Environmental Engineering at the University of Detroit Mercy. The next generation is more environmentally conscious than ever before. I firmly believe that the University will benefit by creating this program which will attract more students and prepare UDM graduates with the educational background necessary to protect our natural resources and create sustainable urban environments.

Thank you for your time and attention to this matter. Please feel free to contact me at (248) 535-3322 if you have any questions or require additional information.

Very truly yours,
HUBBELL, ROTH & CLARK, INC.

Jesse B. VanDeCreek, P.E. Associate
Appendix D: Course Syllabi
CIVE 5860 – Environmental Microbiology and Design
Term I, 2013-2014
Monday and Wednesday  2:00 – 3:15 PM
Engineering Room #234
Fall 2013

Course Description: Environmental Microbiology and Design. Credit 3. Principles of environmental microbiology, including classification of microorganisms, microbial ecology, and use of microorganisms in engineered and natural treatment systems.


INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041

Goals: This course is designed to provide the environmental engineer with the fundamentals of microbiology needed to solve complex environmental problems. It also presents the student with information on physiological types of organisms; interactions between microorganisms and with plants and animals; microbial communities and their successional processes; quantitative measurement of numbers, biomass, and activity of microorganisms; microbial habitats; biogeochemical cycling activities; and applications of microbial ecology to biodeterioration control, sanitation, soil conservation, pollution control, and biological control of pests and pathogens

Course Outcomes: After taking this course, students should be able to:
1) Balance chemical equations and compute kinetic rates
2) Perform statistical analysis of analytical data
3) Analyze and interpret data of measured environmental quality parameters using modern analytical and technical methods

Prerequisite by topic: 1. Linear algebra
2. Differential Equation
3. Integral formulation
**Topics:**
1. Introduction to the material  
2. Microorganisms in the Environment  
3. Redox Chemistry  
4. Microbial Cells  
5. Microbial Metabolism  
6. Microbial Kinetics  
7. Microbial Ecology and Diversity  
8. Methods and Applications in Microbial Ecology  
9. Term Report and Presentation  
10. Examination

**Computer Usage:** Excel Program to prepare tables and charts  
Microsoft Word to write essays  
Powerpoint for presentations

**Grading:**
100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

The Total weight of 100% consists of the following components:

- Homework 20%
- Midterm 35%
- Final 35%
- Project 10%

**Final Exam:** Thursday, Dec 12, 2013, 2:00 – 3:50 P.M.

**Make-up Exams:** Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted. Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

**Office Hours:** M, W 1:00 – 2:00 PM in E266 or by appointment
<table>
<thead>
<tr>
<th><strong>Phone Number:</strong></th>
<th>(313) 993-1041, Email: <a href="mailto:rihanaa@udmercy.edu">rihanaa@udmercy.edu</a></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Integrity:</strong></td>
<td>Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&amp;S Student Handbook for further explanation of academic integrity.</td>
</tr>
<tr>
<td><strong>Electronics:</strong></td>
<td>Electronics not used for academic purposes must be turned off or silenced. No texting, Facebook updating, tweeting, etc. should be done during class under any circumstance. Those violating this policy will be asked to leave. Note that cell phones may <strong>NOT</strong> be used as calculators on quizzes and exams.</td>
</tr>
<tr>
<td><strong>Students with Disabilities:</strong></td>
<td>UDM is committed to all students achieving their potential. If a student has a disability or believes that s/he may have a disability (including a physical, mental, or emotional disability) that may require an accommodation, students should contact Emilie Gallegos in the University Academic Services (UAS) office for further discussion. The UAS office is located on the third floor of the Library. Because accommodations often require adequate time to implement, students should make arrangements to contact the UAS as soon as possible.</td>
</tr>
</tbody>
</table>
Course Description:
Methods used for disposal or detoxification of hazardous wastes, including landfill, thermal chemical and biological processes.

Required Text: Hazardous Waste Management, LaGrega et al.
ISBN: 0070393656

Instructor: Dr. Alexa Rihana, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041
Email: rihanaa@udmercy.edu

Electronics: Electronics not used for academic purposes must be turned off or silenced. No texting, Facebook updating, tweeting, etc. should be done during class under any circumstance. Those violating this policy will be asked to leave. Note that cell phones may NOT be used as calculators on quizzes and exams.

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Course Learning Outcomes

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

1) Understand characterizations and classifications of hazardous waste
2) Understand fundamental chemical nomenclatures
3) Understand physical-chemical properties of chemicals and structures
4) Understand the fate and transport of contaminants and waste disposal and storage
5) Identify and formulate toxic exposure
6) Formulate and solve physicochemical processes design problems such as air stripping, carbon adsorption, chemical oxidation, membrane processes
7) See that there is much more to learn and seeing the importance of being an active stakeholder.
8) Understand and identify biological remediation methods through innovative approaches
9) Have a broader knowledge of contemporary issues
10) Communicate effectively either by oral presentation or written reports
11) Analyze and interpret data of measured environmental parameters

Topics Covered:

- Fundamentals (5 classes):
  - Regulatory process
  - Fate
  - Transport
  - Toxicology
- Management Practices (5 classes):
  - Environmental audits
  - Waste minimization
- Treatment Methods (10 classes):
  - Physicochemical
  - Bioremediation
  - Stabilization
  - Incineration
  - Land disposal
- Site Remediation (4 classes)
- Term Report Presentation (2 classes)
- Examination (1 class)

Class Schedule:

Two 75-minute class sessions per week, M and W: 3:15 – 4:45.
Final Exam: Monday, Dec. 16, 2:00 – 3:50 PM
**Computer Usage:** Excel Program to prepare tables and charts
Microsoft Word to write essays

**Grading:**

- 100-95% = A,
- 94-90% = A-,
- 89-86% = B+,
- 85-83% = B,
- 82-80% = B-,
- 79-76% = C+,
- 75-73% = C,
- 72-70% = C-,
- 69-65% = D+,
- 64-60% = D,
- Below 60% = F

The Total weight of 100% consists of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
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<tr>
<td>Midterm</td>
<td>30%</td>
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<tr>
<td>Final</td>
<td>30%</td>
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<tr>
<td>Paper</td>
<td>10%</td>
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**MAKE-UP EXAMS:** Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted. Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

**Office Hours:** Mondays, Wednesdays 1:00-2:00 PM in E266 or by appointment

**Phone Number:** (313) 993-1041, Email: rihanaa@udmercy.edu
CIVE 5500 – Water and Wastewater Engineering  
Term II, 2013

Catalog Data: Water and Wastewater Engineering. Credit 3. Collection, treatment and distribution of water for domestic, fire, and industrial uses. Collection, treatment and disposal of domestic, industrial and storm wastes. Analysis and design of water and wastewater treatment systems.

Prerequisites: Graduate standing


INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering  
Office Room: E 266  
Phone: 993-1041  
Time & Place: 2:00 – 3:15 PM. M,W E222.

Goals: This course is designed to provide the environmental engineer with the necessary background information for design and assessment of treatment processes in water and wastewater treatment operations.

Course Outcomes: After taking this course, students should be able to:  
1) Apply the principles of physical, chemical, and biological treatment processes to surface water and groundwater  
2) Identify benefits and limitations of each treatment process while designing sustainable solutions  
3) Design water and wastewater treatment system  
4) Apply uncertainty and sensitivity analyses in the design project  
5) Draw flow diagram for treatment processes  
6) Research a social issue linked to water resources and deliver a term paper and a presentation

Prerequisite by topic:  
1. Linear algebra  
2. Summation  
3. Integral formulation

Computer Usage: Excel Program to prepare tables and charts  
Microsoft Word to write essays
GRADING:  
100-95% = A,  94-90% = A-,  89-86% = B+,  85-83% = B,  82-80% = B-,  79-76% = C+,  75-73% = C,  72-70% = C-,  69-65% = D+,  64-60% = D,  Below 60% = F

The Total weight of 100% consists of the following components:

- Homework  15%
- Midterm  30%
- Final  30%
- Paper  10%
- Project  15%

Midterm – Monday February 25, 2013

Term project is due Monday April 15, 2013  
Term paper is due Wednesday April 17, 2013

No class on Monday, January 21, 2013 – Martin Luther King, Jr. Holiday

Final Exam:  Monday, April 22, 2013  12:00 – 1:50 P.M.

MAKE-UP EXAMS: Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted.

Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours:  
M  1:00 – 2:00 PM, E266  
W  1:00 – 2:00 PM, E266  or by appointment

Phone Number:  (313) 993-1041, Email: rihanaa@udmercy.edu

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.
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CIVE 4500 – Water and Wastewater Engineering
Term II, 2013


Prerequisites: ENGR 3140


INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041
Time & Place: 2:00 – 3:15 PM. M,W E222.

Goals: This course is designed to provide the environmental engineer with the necessary background information for design and assessment of treatment processes in water and wastewater treatment operations.

Course Outcomes: After taking this course, students should be able to:
1) Understand and apply physical, chemical, and biological treatment processes in water and wastewater plants (ABET 3a)
2) Identify benefits and limitations of each treatment process (ABET 3j)
3) Design water and wastewater treatment system (ABET 3c)
4) Analyze and interpret data of measured water quality parameters (ABET 3b)
5) Draw flow diagram for treatment processes (ABET 3k)
6) Work as a team on a term report and presentation (ABET 3d,g)

Prerequisite by topic: 1. Linear algebra
2. Summation
3. Integral formulation

Computer Usage: Excel Program to prepare tables and charts
Microsoft Word to write essays
GRADING: 100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

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<td>Final</td>
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</tr>
<tr>
<td>Project</td>
<td>10%</td>
</tr>
</tbody>
</table>

Midterm – Monday February 25, 2013

Term project is due Monday April 15, 2013

No class on Monday, January 21, 2013 – Martin Luther King, Jr. Holiday

Final Exam: Monday, April 22, 2013 12:00 – 1:50 P.M.

MAKE-UP EXAMS: Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted.

Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours: M 1:00 – 2:00 PM, E266
W 1:00 – 2:00 PM, E266 or by appointment

Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.
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CIVE 5510 – Water and Wastewater Engineering Laboratory  
Term II, 2009

Catalog Data: Water and Wastewater Engineering Laboratory. Credit 1. Laboratory to accompany CIVE 4500.

Prerequisites: Graduate Standing

Text Book: No text book is required for this class. Handouts will be provided for every laboratory exercise.

INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering  
Office Room: E 266  
Phone: 993-1041  
Time & Place: 2:00 – 5:00 PM. T. E136.

Goals: This course is designed to provide the environmental engineer with hands-on experience for measuring water quality parameters and performing procedures used in treatment processes in water and wastewater plant operations.

Course Outcomes: After taking this course, students should be able to:  
1) Understand and observe first-hand applications of physical, chemical, and biological treatment processes in water and wastewater plants  
2) Design and conduct experiments by following standard procedures  
3) Work as a team to conduct experiments and obtain results, and communicate the findings in written reports  
4) Analyze and interpret data of measured water quality parameters

Prerequisite by topic:  
1. Linear algebra  
2. Summation  
3. Integral formulation

Topics:  
1. Safety Laboratory  
2. Turbidity Measurement  
3. Conductivity Measurement  
4. Hardness Measurement  
5. Color Measurement  
6. Alkalinity and Acidity Measurement  
7. Coagulation  
8. Microscope use
9. Biochemical Oxygen Demand Measurement
10. Chlorine Residual Measurement
11. Coliforms Determination

**Computer Usage:**
- Excel Program to prepare tables and charts
- Microsoft Word to write essays

**GRADING:**
- 100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

The Total weight of 100% consists of the following components:

- Laboratory Reports 80%
- Laboratory Quiz 10%
- Term Project 10%

for graduate students, lab reports are expected to be more elaborate with more details and questions, and they’ll be graded differently than undergraduate reports.

**MAKE-UP LABS:**
- No Make-Up for missed laboratory exercises. Lab reports grades will be reduced 10% per day if they are turned in after the end lab session on the day they are due. Written reports must be prepared in a neat, professional format with correct spelling and grammar.

**Withdrawal Date:** March 26, 2009

**Office Hours:** M, W 1:00 – 2:00 PM, E266

**Phone Number:** (313) 993-1041, Email: rihanaa@udmercy.edu

**Academic Integrity:** Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.
CIVE 4510 – Water and Wastewater Engineering Laboratory
Term II, 2009

2001-2003 Catalog Data: CIVE 451 Water and Wastewater Engineering Laboratory. Credit 1. Laboratory to accompany CIVE 450.

Prerequisites: Engin 314

Text Book: No text book is required for this class. Handouts will be provided for every laboratory exercise.

INSTRUCTOR: Dr. Alexa Rihana-Abdallah, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041
Time & Place: 2:00 – 5:00 PM. T. E136.

Goals: This course is designed to provide the environmental engineer with hands-on experience for measuring water quality parameters and performing procedures used in treatment processes in water and wastewater plant operations.

Course Outcomes: After taking this course, students should be able to:
1) Understand and observe first-hand applications of physical, chemical, and biological treatment processes in water and wastewater plants (ABET 3a)
2) Design and conduct experiments by following standard procedures (ABET 3b)
3) Work as a team to conduct experiments and obtain results, and communicate the findings in written reports (ABET 3d,g)
4) Analyze and interpret data of measured water quality parameters (ABET 3b)

Prerequisite by topic: 1. Linear algebra
2. Summation
3. Integral formulation

Topics: 1. Safety Laboratory
2. Turbidity Measurement
3. Conductivity Measurement
4. Hardness Measurement
5. Color Measurement
6. Alkalinity and Acidity Measurement
7. Coagulation
8. Microscope use
9. Biochemical Oxygen Demand Measurement
10. Chlorine Residual Measurement
11. Coliforms Determination

Computer Usage: Excel Program to prepare tables and charts
Microsoft Word to write essays

GRADING: 100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

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<tr>
<td>Laboratory Reports</td>
<td>70%</td>
</tr>
<tr>
<td>Attendance &amp; Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Laboratory Quiz</td>
<td>10%</td>
</tr>
<tr>
<td>Term Project</td>
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MAKE-UP LABS: No Make-Up for missed laboratory exercises. Lab reports grades will be reduced 10% per day if they are turned in after the end lab session on the day they are due. Written reports must be prepared in a neat, professional format with correct spelling and grammar.

Withdrawal Date: March 26, 2009

Office Hours: M, W 1:00 – 2:00 PM, E266

Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.
CIVE 5800 – Biological Environmental Processes
Term III, 2013

Course description: CIVE 5800 – Biological Environmental Processes. Credit 3. Microorganisms in the environment, bacterial growth and transport in terrestrial, aquatic, and extreme environments, sample collection and processing methods.


INSTRUCTOR: Dr. Alexa Riha, Civil and Environmental Engineering Office Room: E 266 Phone: 993-1041 Time & Place: 6:00 – 8:50 PM. M, W E222.

Goals: This course is designed to provide a comprehensive introduction to the complex field of bacterial processes in different environments: terrestrial, aquatic, aerosols, and extreme surroundings. Novel techniques and cutting edge methods will be introduced for sample collection and processing. In addition, risk assessment and remedial technologies will be discussed.

Prerequisite by topic: Environmental Microbiological Design

Learning Outcomes: After taking this course, students should be able to:
1) Apply the principles of physical, chemical and biological processes to the treatment of water, waste water and unit operations.
2) Apply sustainability principles to the design of environmental systems.
3) Design and implement intelligent engineered solutions to polluted sites using innovative techniques

Topics:
1. Introduction to Environmental Processes 1 class
2. Microorganisms in the Environment 3 classes
3. Organic and Inorganic Pollutants 3 classes
4. Terrestrial Environment, Bioaerosols, Aquatic and Extreme Environments 4 classes
5. Microbial Transport 2 classes
6. Sample Collection and Processing:
   Microscopic Techniques, Physiological and
Immunological Methods
7. Risk assessment, Remedial technologies
8. Term Report and Presentation
9. Examination

Computer Usage:
Excel Program to prepare tables and charts
Microsoft Word to write essays
Power Point for term paper presentation

GRADING:
100-95% = A,  94-90% = A-,  89-86% = B+,  85-83% = B,  82-80% = B-,
79-76% = C+,  75-73% = C,  72-70% = C-,  69-65% = D+,  64-60% = D,
Below 60% = F

The Total weight of 100% consists of the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
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<tr>
<td>Midterm</td>
<td>30%</td>
</tr>
<tr>
<td>Final</td>
<td>30%</td>
</tr>
<tr>
<td>Term Paper</td>
<td>10%</td>
</tr>
</tbody>
</table>

Midterm – Wednesday, May 29, 2013
Term paper is due Final Week of classes

Final Exam:
Monday, June 24, 2013  6:00 – 8:00 P.M.

MAKE-UP EXAMS:
Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted. Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours:
M, W  1:00 – 2:00 PM, E266  or by appointment

Phone Number:
(313) 993-1041, Email: rihanaa@udmercy.edu

Academic Integrity:
Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.
**Students with Disabilities:** UDM is committed to all students achieving their potential. If a student has a disability or believes that s/he may have a disability (including a physical, mental, or emotional disability) that may require an accommodation, students should contact Emilie Gallegos in the University Academic Services (UAS) office for further discussion. The UAS office is located on the third floor of the Library. Because accommodations often require adequate time to implement, students should make arrangements to contact the UAS as soon as possible.
Course Description: Environmental Risk Analysis and Design. Credit 3. Understand and mitigate risk associated with handling chemicals; characteristics of risk analysis; hazard identification; fault tree analysis; exposure assessment; dose response; risk management and regulations.


INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041
Time & Place: 4.00 – 6.30 PM. M,W E208.

Goals: This course is designed to provide the environmental engineer with the necessary background information for design, characterization, and assessment of risk and exposure associated with hazardous materials, and to be familiar with risk management and regulations.

Course Outcomes: Upon the successful completion of this course, students will be able to:
1. Understand the characteristics of risk analysis
2. Understand the impact of risk analysis on decision making and the society
3. Carry out a hazard identification
4. Perform and interpret a fault tree analysis
5. Understand how to monitor, characterize, and assess exposure
6. Calculate dose response
7. Comprehend risk management and be familiar with associated regulations
8. Work as a team on a design project and communicate the findings in oral presentations and written reports

Prerequisite by topic: 1. Linear algebra
2. Summation
3. Integral formulation
Topics:
1. Introduction and Definition 4 classes
2. Hazard Identification 2 classes
3. Fault tree analysis 2 classes
4. Dose Response and Risk Characterization 1 class
5. Environmental Assessment 2 classes
6. Risk Management 1 class
7. Regulations and ISO 14000 2 classes
8. Design Project Presentation 1 class
9. Examination 1 class

Computer Usage: Excel Program to prepare tables and charts
Microsoft Word to write essays

GRADING:
100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 
79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, 
Below 60% = F

The Total weight of 100% consists of the following components:

Homework 25%
Midterm 30%
Final 30%
Project 15%

Midterm – Monday Nov 7, 2011
Term project is due Monday Dec 5, 2011

Final Exam: Monday, Dec 12, 2011 5.00 – 6.50 P.M.

MAKE-UP EXAMS: Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted. Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours: Monday 1:00 – 4:00 PM, E266 or by appointment
Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

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INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering Office Room: E 266 Phone: 993-1041 Time & Place: 3:00 – 5:51 PM. M,W E222.

Goals: This course is designed to provide the environmental engineer with the necessary background information for design and assessment of treatment processes in water and wastewater treatment operations.

Course Outcomes: Upon the successful completion of this course, students will be able to:
1. Describe the issues related to solid waste composition and management
2. Derive specific weight, percentage distribution, and chemical formula for a specific waste
3. Determine the physical, chemical, and biological properties of municipal solid waste
4. Compute statistical data for waste generation
5. Evaluate collection operation and landfill emission rate
6. Discuss and communicate their knowledge of contemporary issues
7. Apply sustainability principles to the design of landfill storage facilities.

Prerequisite by topic: 1. Linear algebra 2. Summation 3. Integral formulation
Topics:

1. Introduction to the material
2. Evolution of Solid Waste Management
3. Sources, Types, and Composition of Municipal Solid Waste
4. Physical, Chemical, and Biological Properties of Municipal Solid Waste (MSW)
5. Sources, Types, and Composition of Hazardous Wastes Found in MSW
6. Generation Rates of Solid Waste
7. Collection Processes of Solid Waste
8. Disposal of Solid Wastes in Landfill
9. Recycling of Materials in Solid Wastes

Computer Usage:
Excel Program to prepare tables and charts
Microsoft Word to write essays

GRADING:
100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

The Total weight of 100% consists of the following components:

<table>
<thead>
<tr>
<th>Component</th>
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<tbody>
<tr>
<td>Homework</td>
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<tr>
<td>Midterm</td>
<td>30%</td>
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<tr>
<td>Final</td>
<td>30%</td>
</tr>
<tr>
<td>Paper</td>
<td>10%</td>
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</table>

Midterm – Wednesday, May 29, 2013
Final – Monday, June 24, 2013

Term paper is due Wednesday, June 19, 2013

No class on Monday, May 27, 2013 – Memorial Day Holiday

Final Exam:
Thursday, June 27, 2013 12:00 – 2:00 P.M.

MAKE-UP EXAMS:
Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted.
Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours: E266 or by appointment

Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

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ISBN: 9780471924357

INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering  
Office Room: E 266  
Phone: 993-1041  
Time & Place: 4:00 – 6:30 PM. Mondays E208

Learning Outcomes: After taking this course, students should be able to:  
1) Apply the principles of physical, chemical and biological processes to the treatment of water, waste water and unit operations.  
2) Apply sustainability principles to the design of environmental systems.  
3) Design and implement intelligent engineered solutions to mitigate challenging environmental problems or meet specific human needs.

Topics:  
1. Introduction to Environmental Processes  
10. Material Balance Relationship  
11. Reaction Orders  
12. CMBR, CMFR, PFR  
13. Transport Processes (Diffusion, Advection, Dispersion)  
14. Equilibrium and Energetics  
15. Adsorption  
16. Ion Exchange  
17. Ultrafiltration  
18. Electrodialysis
Computer Usage: Excel Program to prepare tables and charts
Microsoft Word to write essays
Power Point for term paper presentation

GRADING: 100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F
The Total weight of 100% consists of the following components:

- Homework 10%
- Midterm 30%
- Final 30%
- Project 30%

Midterm – Monday November 5, 2012
Project is due Final Week of classes

Final Exam: Monday, December 10, 2012 4:00 – 5:50 P.M.

MAKE-UP EXAMS: Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted.

Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Office Hours: M, W, F 1:00 – 2:00 PM, E266 or by appointment

Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

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CIVE 5840 – Environmental Chemistry and Design
Term II, 2013


INSTRUCTOR: Dr. Alexa Rihana, Civil and Environmental Engineering
Office Room: E 266
Phone: 993-1041
Time & Place: 3:30 – 5:10 PM. M,W E223.

Goals: This course is designed to provide the environmental engineer with the fundamentals of chemistry needed to solve complex environmental problems. It also presents the student with information on quantitative, qualitative, and instrumental methods of analysis needed in assessing, water or air quality, as well as soil and sediment clean-up.

Course Outcomes: After taking this course, students should be able to:
12) Balance chemical equations and compute kinetic rates
13) Perform statistical analysis of analytical data
14) Analyze and interpret data of measured environmental quality parameters using modern analytical and technical methods
15) Apply the principles of physical, chemical and biological processes to the treatment of water, waste water and unit operations.
16) Apply sustainability principles to the design of environmental systems.

Prerequisite by topic:
1. Linear algebra
2. Differential Equation
3. Integral formulation

Topics:
1. Introduction to the material 1 class
2. Basic Concepts from General Chemistry 2 classes
3. Basic Concepts from Physical Chemistry  2 classes
4. Basic Concepts from Organic Chemistry  2 classes
5. Basic Concepts from Equilibrium Chemistry  4 classes
6. Basic Concepts from Biochemistry  2 classes
7. Basic Concepts from Colloid Chemistry  1 class
8. Basic Concepts from Nuclear Chemistry  1 class
9. Statistical Analysis of Analytical Data  2 classes
10. Quantitative Chemistry  2 classes
11. Instrumental Methods of Analysis  2 classes
12. Volatile Acids, Gas Analysis, and Trace Contaminants  2 classes
13. Examination  1 class

Computer Usage:
Excel Program to prepare tables and charts
Microsoft Word to write essays

GRADING:
100-95% = A, 94-90% = A-, 89-86% = B+, 85-83% = B, 82-80% = B-, 79-76% = C+, 75-73% = C, 72-70% = C-, 69-65% = D+, 64-60% = D, Below 60% = F

The Total weight of 100% consists of the following components:

Homework  20%  Midterm  35%  Final  35%  Paper  10%

Midterm – Wednesday Feb 27, 2013
Final Exam:  Monday, April 22, 2013  2:00 – 3:50 P.M.

MAKE-UP EXAMS: Notification of an expected missed exam must be given prior to the scheduled exam time and instructor permission will only be given under special circumstances. Homework assignments will not be accepted once corrected papers have been returned or solutions have been posted. Homework grades will be reduced 10% per day if assignments are turned in after the end of class on the day they are due. Written assignments must be prepared in a neat, professional format with correct spelling and grammar.

Withdrawal Date: No Classes on Monday January 21, 2013
Office Hours: M 3:30 – 5:00 PM, E266
W 1:00 – 2:00 PM, E266 or by appointment

Phone Number: (313) 993-1041, Email: rihanaa@udmercy.edu

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course. Please refer to the University Catalog and E&S Student Handbook for further explanation of academic integrity.

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Catalog: Design projects in Geographic Information Systems (GIS). Students will be able to acquire GIS data, process the data geographically, assess the reliability of the data, and customize the graphic user interface, and software function. Students will be able to compare functionality of several GIS packages.

Prerequisite: CE 340 Surveying

Prerequisite by Topic: Understanding of map creation, and computer programming.

Required Text: None.

Instructor: Dr. Alan Hoback, P.E., Office E262, Phone 313-993-1578 hobackas@udmercy.edu (Put CE591 in the subject line.)

Class Time: TBA.

Consultation: TDB

Objective: The GIS course enables students to create and edit maps, assess data reliability, and create a user interface suitable to user needs.

Course Outcomes: After taking this course, the students will be able to:

1) Acquire data and enter it into GIS through images, digitization, GPS and geocoding.
2) Assess data reliability.
3) Perform geographic processing.
4) Customize the GUI and add software function.
5) Compare types of GIS systems.

Computer use policy:

This course is computer intensive.

Supplies:

A USB drive is necessary equipment for this course to make files transportable. (Flash, Jump, etc.)

Topics: See “Projects” below.

Grading:

<table>
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<tr>
<th>Project</th>
<th>80%</th>
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</thead>
<tbody>
<tr>
<td>Written Assignments</td>
<td>20%</td>
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</tbody>
</table>

Projects and Written Reports:

1) Create a written report assessing the reliability of GIS. See the file: worksheet.doc.
2) Create reports for each of the following GIS tutorials. The report should be a printed “layout” showing completion of the tutorial. Michigan, Campus, Site selection,
Sustainable Communities, GPS housing or Utilities, Roads, Accidents, Contours. (Do in version 9 ArcView) Optional: Dams, Detroit.

3) Create a written report comparing functionality of the following mapping and GIS packages. AutoCAD, Google Earth, Esri, MapInfo, MicroStation, MSN Virtual Earth, Yahoo Maps, MapQuest. (Approximately 3 pages.) Provide analysis of your experience using at least these: Google Earth, MapQuest.

4) Customizing GIS: Change the Graphical User Interface (GUI) to add a button. (Do in version 9 ArcView.)

5) Mapping project: Choice of project will be determined by student area of interest.
CIVE 5850: Project Management and Cost
Term I, 2013


Text: Project Management: The Managerial Process, Gray, Clifford F., Larson, Erik W.

Instructor: Dr. Utpal Dutta
Office E 265
Phone 993-1040

Time and Place: Monday 4:00-7:00, Room E237

Goals: This course is designed to expose engineering students to various components of project management.

Grading:

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<th>Score Range</th>
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<td>87 - 90</td>
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<td>84 - 86</td>
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<td>71 - 73</td>
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<tr>
<td>61 - 70</td>
<td>D</td>
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<tr>
<td>below 61</td>
<td>F</td>
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</table>

Midterm 25%
Final Exam 30%
Project 15%
Chapter quiz/Home assignment 20%
MS Project Presentation 10%

Midterm Oct. 28, 2013,
Class project due Dec.9, 2013

Phone Number: (313)993-1040,
Email: Duttau@Udmercy.edu
Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course. (Please refer to the University Catalog and E&S student handbook for further explanation of academic integrity)

Note: There will be Chapter quiz at the end of each chapter (First 30 minutes of each class) Also Each student will present one module of MS Project Last 30 minutes of each class (Grading weight 10%)

Final Exam: Dec. 16, 2013

Make-up exams will only be given under special circumstances and will be more difficult than the original exam. If you do not contact the instructor prior to the date of exam and you do not show up for an exam, you will receive a zero and no make-up will be given. Also penalty (10% per day for late homework).

Withdrawal Dates: Nov. 18, 2013

Office Hours: Monday 2:00-4:00 PM and After class

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<th>Schedule</th>
<th>Assignment/Case Study/Plan</th>
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<tr>
<td>1</td>
<td>Introduction to Course</td>
<td>Your management Skill</td>
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<td></td>
<td>Ch. 1</td>
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<td>2</td>
<td>Guest Speaker</td>
<td>Dr. Moylan, PMI Board Member</td>
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<td></td>
<td>Ch. 2</td>
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<td>3</td>
<td>Ch. 3</td>
<td>Guest Speaker PMI Great lake Chapter</td>
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<td>4</td>
<td>Ch. 4 &amp; 5</td>
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<tr>
<td>5</td>
<td>Chapter 6 &amp; 7</td>
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<td>6</td>
<td>Chapter 8</td>
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<td>7</td>
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<tr>
<td>8</td>
<td>Ch 9</td>
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<td>9</td>
<td>Ch. 11: Team Building, Guest</td>
<td>Dr. Linda Slow UDM</td>
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<td>Speaker</td>
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<td>10.</td>
<td>Ch. 10: Leadership, Guest</td>
<td>Dr. Zimmerman-Oster, UDM</td>
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<td>Speaker</td>
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<td>11</td>
<td>Ch.12: Outsourcing: Guest</td>
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<td>Speaker</td>
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<td>13.</td>
<td>Group presentation</td>
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<tr>
<td>14</td>
<td>Final Exam</td>
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CIVE 4530/5530 Applied Hydraulics and Hydrology

Instructor: Jeffrey H. Bednar, PE, CFM, Adjunct Professor of Civil Engineering
bednarjh@udmercy.edu

Lecture Time (Location): 6:40 – 9:10 PM, Thursday (Room E224)

Office Hours: By appointment, before or after class preferred


Supplements: We will make use of Excel for some examples and homework problems. There may also be handouts for material not covered in the text.

Course Description:
This course provides the important fundamentals and practical concepts of hydraulics and hydrology as they are used in everyday civil engineering practice. Topics covered in hydraulics include flow in pipes, pump system, pipe network, open channel flow, hydraulic structures, and groundwater flow. The hydrologic topics include hydrologic cycle and budget, statistical analysis, precipitation, peak flow determination methods, runoff hydrograph analysis and synthesis, urbanization effects on runoff, and detention basin design. This course also will include an overview of some hydraulic and hydrologic computer models such as SWMM, HEC-HMS, and HEC-RAS.

Course Objectives:
Upon completion of this course, students will be able to:
1. Apply probability concepts and statistical analysis to flood and rainfall events and evaluate the risk of an event occurrence during the design life
2. Learn how to explain and apply continuity, energy, and momentum equations to solve hydraulics problems including flow in closed conduits, open channels, pumps, and groundwater flow.
3. Estimate major and minor energy losses and construct energy and hydraulic grade lines
4. Analyze flow in a series and parallel pipe system
5. Develop and use the pump-head characteristic curve and the system-head capacity curve to determine the operating point for a pump and determine the characteristic curve for multiple pumps in a system
6. Learn how to use the Hardy Cross method to determine pipe flow and pressure in a network
7. Explain the water hammer effect and determine the pressure change in a pipe as a result of a sudden valve closure
8. Define and compute the hydraulic characteristics of open channels such as flow, velocity, normal and critical depths, and specific energy.
9. Learn how to classify various flow profiles and calculate their shape.
10. Define rapidly varied flow and hydraulic jump and assess whether it will occur upstream or downstream of a given location.
11. Compute the flow conditions of a hydraulic structure with a weir, an orifice, or a culvert.
12. Learn the methods to calculate groundwater flow, well hydraulics at steady and unsteady conditions.
13. Calculate design flows using the Rational Method.
14. List the watershed characteristics affecting the direct runoff hydrograph.
15. Develop a design storm using measured rainfall data for a site.
17. Construct synthetic unit hydrograph using the SCS approach.
18. Apply unit hydrograph concepts to predict the direct runoff hydrograph from rainfall excess.
19. Estimate the detention basin volume due to land development (urbanization effect).

Policy Notes:

Homework:

All homeworks will be due at the start of class one week after the date assigned. There is no provision for make-up of homework assignments. A missed homework assignment is a zero and will be factored into the final grade. Students should expect a homework assignment presented almost every week in the lecture meeting.

Quizzes:

Quizzes will be given approximately once every two weeks. Quizzes will be either announced or unannounced; therefore your attendance is critical to your success. There is no provision for make-up of any quiz. A missed quiz is a zero and will be factored into the final grade.

Disability Support Services and Accommodations:

It is very important for students to be proactive with regard to requesting disability accommodations. While it is never required that you disclose your disability to your professors, all students at UDM are encouraged to talk to their professors to discuss their concerns. Faculty cannot provide disability accommodations without official notification from the Disability Support Services office. If you need an accommodation because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact Emilie Wetherington as soon as possible to schedule an appointment (gallegem@udmercy.edu or (313) 578-0310). Disability Support Services is located in the Student Success Center, Room 319, on the 3rd Floor of the Library, McNichols Campus. 3

Course Schedule: Date       Week       Topic with Selected Details
8/29/13   1         Course Introduction
                      Watershed Simulation Model
9/5/13    2         Probability
<table>
<thead>
<tr>
<th>Date</th>
<th>No.</th>
<th>Topic</th>
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<tbody>
<tr>
<td>9/12/13</td>
<td>3</td>
<td>Precipitation and Runoff – review chapter 11</td>
</tr>
<tr>
<td>9/19/13</td>
<td>4</td>
<td>Fundamental Properties of Water – review chapter 1</td>
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<td>Water Pressure and Pressure Forces – review chapter 2</td>
</tr>
<tr>
<td>9/26/13</td>
<td>5</td>
<td>Water Flow in Pipes – review chapter 3</td>
</tr>
<tr>
<td>10/3/13</td>
<td>6</td>
<td>Pipelines and Pipe Networks – review chapter 4</td>
</tr>
<tr>
<td>10/10/13</td>
<td>7</td>
<td>Water Pumps – Review chapter 5</td>
</tr>
<tr>
<td>10/17/13</td>
<td>8</td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>10/24/13</td>
<td>9</td>
<td>Water Flow in Open Channels, Part 1 – review chapter 6</td>
</tr>
<tr>
<td>10/31/13</td>
<td>10</td>
<td>Water Flow in Open Channels, Part 2</td>
</tr>
<tr>
<td>11/7/13</td>
<td>11</td>
<td>Groundwater Hydraulics – review chapter 7</td>
</tr>
<tr>
<td>11/14/13</td>
<td>12</td>
<td>Hydraulic Structures – review chapter 8</td>
</tr>
<tr>
<td>11/21/13</td>
<td>13</td>
<td>Flow Measurement – review chapter 9</td>
</tr>
<tr>
<td>11/28/13</td>
<td>14</td>
<td>THANKSGIVING (No Class)</td>
</tr>
<tr>
<td>12/5/13</td>
<td>15</td>
<td>Urbanization Effects Course Review</td>
</tr>
<tr>
<td>12/12/13</td>
<td>16</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
Lecture: 5:15-6:30 Mondays and Wednesdays in E 239

Instructor: Jonathan Weaver, Mechanical Engineering Department

2013-2014 Graduate Catalog Data: Credit 3. Study of techniques for designing and analyzing experiments such that the results will yield the maximum useful information. Coverage includes: experimental design and analysis, testing of hypothesis, analysis of variance and covariance, graphical techniques, factorials, incomplete blocks, Latin squares, response surfaces, and case studies. A team project is required.

Prerequisites: MTH 4270/5270 (Probability and Statistics)

Required Textbook:

Good References:

Goals: The goal of this course is to increase research, development, and engineering efficiency in product design and manufacturing. Primary emphasis will be on techniques for designing and analyzing experiments such that the results will yield the maximum useful information. Theoretical study will be presented but emphasis will be on practical application and analysis. The course will train to exclude or account for random effects, to plan and space the testing sequence, to evaluate errors and their effects, and to layout the resulting data in an orderly and revealing manner. Traditional DOE methods will be emphasized, though time-permitting, Taguchi style techniques will be introduced. Some hand calculations will be required to stress understanding of the methodologies although the majority of the analyses will be done using a statistical software package. A team project is required.

Prerequisites by Topic:
1. Introductory probability theory
2. Sampling and distributions
3. Estimations and hypothesis testing

Topics:
It is planned to cover most of the material in the Chapters 1-6 and 8 of Montgomery with supplemental material and examples/case studies introduced as appropriate. Remaining chapters will not be covered rigorously although some important material therein will be presented. Key topics will include:
1. Test size, Spacing, and Sequence
2. T-student Distribution
3. Analysis of Variance
4. Randomized Blocks
5. Latin Squares
6. Factorial and Fractional Factorial Designs
7. Basics of Regression Analysis
8. Basics of Response Surfaces
9. Intro to Taguchi Methods

Outcomes:
1. Understand and use the terminology of Design of Experiments. (outcome b)
2. Analyze single- and multi-factor experiments from given data. (outcome b, ME outcome m)
3. Reasonably verify model assumptions (e.g. normality) in various Design of Experiment models. (outcome b)
4. Demonstrate an understanding of the following principles: randomization, replication, blocking, confounding and aliasing. (outcome b)
5. Implement the use of some type of software to solve problems related to Design of Experiments. (outcome b, k)
6. Design, conduct and analyze an experiment using proper DOE procedures and communicate the results. (outcome b, d, g, k, ME outcome m)

Computer Usage:
1. Use of Minitab will be required for most homework assignments. The instructor will be doing numerous demos during lecture running Minitab 16; it is recommended that you run Version 16, but Version 15 provides all the functionality required to do the homework with some interface differences. Students may rent Minitab for 6 months for $29.99 or purchase it outright for $99.99 at www.onthehub.com.
2. All students must have (and regularly read) an email account. This email account should be the one listed with our course Blackboard site.
3. Certain course information will be made available only via our Blackboard site. All students enrolled in the course are automatically enrolled in Blackboard. All students must be in regular contact with our Blackboard site. All course related questions which are not private and could be of general interest to others must be handled on the Discussion Board in Blackboard.

Grading:
Grade: A A- B+ B B- C+ C D F
Average (%): 93 90 87 83 80 77 70 60 <60

Grade Weighting:
Homework 40%
Quizzes 40% (lowest score of the first four quizzes dropped)
Project 20% (10% proposal, 80% write-up, 10% presentation)

Office: E 269
Phone: (313) 993 - 3372
E-mail: weaverjm@udmercy.edu
Office Hours: TR 10:30-11:00 and 1:00-2:00, MW 4:00-5:00. Other times may be possible by appointment.

IMPORTANT DATES:
Quizzes (first 20 minutes of class) * … 9/30, 10/16, 11/06, 11/25, 12/04
Last day to drop without a “W” … 9/02
Fall Break … 10/14-15
Project proposal due … NOON 11/06
Last day to withdraw from class … 11/18
Thanksgiving Break … 11/27-12/01
Project reports due … NOON 12/08
Project presentations (in class) … 12/09

*Some quizzes may be done online outside of class time.

ENGR 5020 DOE Weaver Page 3 of 4 Fall 2013-2014

Academic Integrity:
Students are expected to perform to a high standard of honesty and integrity in this course. See also (1) The UDM Catalog and E&S Student Handbook, and (2) Other policies listed in this syllabus.

Homework:
Homework will typically be due every Monday at NOON. It must be electronically submitted and will be mostly automatically graded. If desired, homework may be done in teams of TWO. If working in a team to do these electronically submitted assignments, both team members must individually submit under his/her own account and both must answer identically to all questions. While helping other students to understand the subject matter is encouraged, collaboration on homework assignments outside of the individual or team of two submitting the assignment is considered cheating. Solutions will be posted shortly after each due date/time. Any questions regarding the solutions should be posted to the Blackboard Discussion Board, and student participation answering other students’ questions is encouraged. Each assignment will contain a (generally different) point value; however each weekly assignment will be given equal weight in computing the overall homework average.

Quizzes:
Quizzes will be generally be done in class (although one or more may be given online) and will require use of the textbook (open book), the notes (open notes), and a calculator (notebook computers or anything running Minitab or another statistical software package may not be used during in-class quizzes, but would be required for any online quizzes).

Project Description:
The required project should reflect approximately 25 productive hours of work PER STUDENT and must be done in teams of not more than THREE. The project must involve designing, planning, executing, analysis, and confirmation of a designed experiment done by the team members during this term. Avoid very simple experiments, full factorials, or experiments for which you already know what the result will be. Recommended designs for the project include fractional factorials, response surface designs, and Taguchi style orthogonal array designs.

The project proposal (aim for 2 pages) should include the following:
- An introduction/problem definition summarizing your objectives. Include some background research (citing any references).
- Description of the intended response metric and how will it be measured.
- Identification of the factors you plan to study for their effect on the response. Also discuss the factor levels if known at this stage. You may or may not know the layout of the exact experiment you will conduct at this time – so just write what you do know at this time.
- Description of the physical needs and time that you envision will be needed to execute the experiment
- Definition of a project timeline for the following major milestones:
  - finalization of experimental plan (factors, levels, experimental design, and measuring of the response)
  - running of the experiment
  - data analysis
Verification experiments
Final report preparation
The final report (submit electronically as a single Word document plus any relevant Excel and Minitab files) shall be typed double-spaced 12pt Arial font and shall NOT exceed 10 pages (excluding figures and appendices). Raw data and all supporting computations should be placed in an appendix. All references must be properly cited. Presentation with appropriate visual aids is required. All work submitted for the project must be work done this semester by the students on the team.

Lecture Format:
Most of the lecture will be projected from a laptop computer with frequent in-class demos in Minitab and Excel. PDFs of the lecture materials and many of the Minitab files used in class will be posted.

Disability Support Services and Accommodations:
It is very important for students to be proactive with regard to requesting disability accommodations. While it is never required that you disclose your disability to your professors, all students at UDM are encouraged to talk to their professors to discuss their concerns. Faculty cannot provide disability accommodations without official notification from the Disability Support Services office. If you need an accommodation because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact Emilie Wetherington as soon as possible to schedule an appointment (gallegem@udmercy.edu or (313) 578-0310). Disability Support Services is located in the Student Success Center, Room 319, on the 3rd Floor of the Library, McNichols Campus.

Other Policies:
1. Electronic homework submissions must be submitted by the date and time per the assignment. If there is any problem with e-submission, email a list of your answers before the due date and time (one email per team of two with both names cited is fine).
2. Cheating on any assignment or on any quiz will result in a grade of F for the term.
3. Quizzes will generally NOT be comprehensive (except to the extent that the subject matter itself is comprehensive). The knowledge to do well on the quizzes should be gained by successfully completing and understanding the homework assignments and the lectures.
4. The lowest quiz grade of the first four quizzes will be dropped. There will be NO makeup quizzes. If you must miss the last quiz or more than one of the first four quizzes, a suitable arrangement must be made with the instructor prior to the quiz date(s).
5. Grading will be highly influenced by legibility and quality of presentation.
6. Requests for re-grades on homework, quizzes, or projects must be submitted IN WRITING (email acceptable for electronically submitted and graded items) within one week of my return of the item on which you question the grade. In this event, the ENTIRE quiz/exam/homework will be re-graded with possible adjustment in either direction.
7. If class is cancelled for any reason on a scheduled quiz date, the quiz will be given either online before the next class or on paper during the next class.
UNIVERSITY OF DETROIT MERCY
FALL 2013

CIVE 5866  GROUNDWATER

COURSE DESCRIPTION

Groundwater and groundwater systems, role of groundwater in hydrologic cycles, physical properties of groundwater and aquifers, principles and fundamental equations of porous media flow and mass transport, well hydraulics and pumping test analysis, water chemistry, groundwater quality and contamination, hydrology management.

INSTRUCTOR

Dr. P D Deo, E-mail: pddeo@cticompanies.com (can be contacted by e-mail to schedule an appointment)

PREREQUISITES

Introductory knowledge of fluid mechanics, hydrology and geology

REQUIRED TEXT BOOK


COURSE OBJECTIVES AND OUTCOMES

Understand the importance of groundwater as a source of drinking water
Understand the fundamentals of fluid flow in porous media
Predict groundwater flow paths in natural systems
Determination of aquifer parameters (hydraulic conductivity, transmissivity, storativity)
Understand the fundamentals of contaminant in the subsurface
Learn the fundamentals of groundwater flow modeling
COMMUNICATION SKILLS AND COMPUTER USAGE

Develop competency in communication skills (technical writing, data analysis and presentation, and public speaking) necessary to integrate technical and professional abilities that are required to succeed in engineering practice. Be proficient in technical tools (Word, Excel, Power Point, analysis software) to solve and present solutions to engineering problems.

TENTATIVE SCHEDULE AND TOPICS


METHOD OF EVALUATION

Quizzes, homework 20% Reading Assignments (students will be expected to read assigned sections from the textbook or handouts), Class participation, Project and presentation in class, 20% Mid term Exam 20% Final Exam 40%

(All homework must be professionally prepared, typed or legibly written and stapled together. Number pages consecutively and use assignment as your cover page, or make you own)
Interdisciplinary Design, Entrepreneurship and Service (IDEAS)
ENT 300/500
TERM I, 2011-12

COURSE DESCRIPTION: This single semester design course has a lecture/studio-lab model. It consists of students in their junior, senior or fifth year from all disciplines (architecture, business administration, digital media, psychology, engineering & science and health professions) forming teams to work on socially beneficial projects. It will emphasize social responsibility, teamwork and communication across disciplines and incorporation of digital media into successful presentations. Topics include the basics of product development; the different aspects of creative thinking in design; and the basics of entrepreneurship and business plan development.

PREREQUISITES: Instructor consent.

PREREQUISITES BY TOPIC: None.

REQUIRED TEXT: None

MISCELLANEOUS: You should check the course website at http://knowledge.udmercy.edu/ regularly for important announcements.

STUDIO INSTRUCTOR:
Nassif Rayess, room E 214, telephone: 993-1402, email: rayesna@udmercy.edu.

LECTURE INSTRUCTORS:
Ram Kesavan, 313-993-1115, kesavar@udmercy.edu
Darrell Kleinke, 313-993-1140, kleinked@udmercy.edu
David Nantais, 313-993-1560, nantaisd@udmercy.edu
Allegra Pitera, 313-993-1533, piteraaj@udmercy.edu
Linda H. Slowik, 313-993-1623, slowikh@udmercy.edu
Jonathan M. Weaver, 313-993-3372, weaverjm@udmercy.edu

OFFICE HOURS: TR 1-3 PM; anytime my office door is open; or by appointment (email or call me).

LECTURE: TR 11:20 AM -12:35 PM, room E222.

COURSE OBJECTIVES: The Interdisciplinary Design, Entrepreneurship and Service (IDEAS) course is aimed at producing UDM college graduates that are able to identify social/community needs, collaborate effectively across disciplines and expertise, employ technical and design skills to devise solutions and have the business savvy to turn their endeavors into successful ventures. This course aims at sowing the seeds of social entrepreneurship into students. These budding
social entrepreneurs will aim at the wholesale remediing of social needs/injustices by employing their acquired business and technology skills.

COURSE OUTCOMES: After taking this course, students will be able to:

Conduct interviews and focus groups to determine user needs.
Conduct patent and literature searches to establish the state of the art.
Function in diverse multidisciplinary groups and resolve conflicts in a team context.
Promote and market ideas and designs.
Design a system, or process to meet desired needs, subject to realistic constraints.
Identify, formulate and solve engineering, architectural and digital media problems.
Be sensitive to social and cultural considerations that influence the design.
Foster creativity through varied individual and team processes.
Appreciate other scientific, engineering and business disciplines.
Integrate interdisciplinary approaches to design.
Conceive and write a business case/plan and a “product pitch.”

COMPUTER USAGE: Varies by discipline with use of Word, Excel and Powerpoint expected. Engineering students will be expected to use Catia and Autocad. Architecture and digital media students will need to use Photoshop and other presentation software.

TOPICS (tentative):

<table>
<thead>
<tr>
<th>Topics</th>
<th>Lectures</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, overview of course, and problem assignment</td>
<td>1 (Rayess)</td>
<td>Sep 6</td>
</tr>
<tr>
<td>Team formation and team building exercises</td>
<td>1 (Rayess)</td>
<td>Sep 8</td>
</tr>
<tr>
<td>Product development (IDEO Deep Dive)</td>
<td>1 (Weaver)</td>
<td>Sep 13</td>
</tr>
<tr>
<td>Intellectual property and literature searches</td>
<td>1 (Rayess)</td>
<td>Sep 15</td>
</tr>
<tr>
<td>Meeting with client/customer</td>
<td>1</td>
<td>Sep 20</td>
</tr>
<tr>
<td>Project work</td>
<td>2 (Rayess)</td>
<td>Sep 22 – Sep 27</td>
</tr>
<tr>
<td>Six hats of creativity</td>
<td>1 (Kleinke)</td>
<td>Sep 29</td>
</tr>
<tr>
<td>Milestone Presentation 1</td>
<td>1</td>
<td>Oct 4</td>
</tr>
<tr>
<td>Social Responsibility</td>
<td>1 (Nantais)</td>
<td>Oct 6</td>
</tr>
<tr>
<td>Social Entrepreneurship</td>
<td>1 (Kesavan)</td>
<td>Oct 11</td>
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<tr>
<td>Project work</td>
<td>1 (Rayess)</td>
<td>Oct 13</td>
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<tr>
<td>Teamwork workshop</td>
<td>1 (Consultant)</td>
<td>Oct 18</td>
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<tr>
<td>Creativity lecture</td>
<td>1 (Slowik and Pitera)</td>
<td>Oct 20</td>
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<tr>
<td>Project work</td>
<td>2 (Rayess)</td>
<td>Oct 25 – Oct 27</td>
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<tr>
<td>Milestone Presentation 2</td>
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<td>Nov 1</td>
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<tr>
<td>Project work</td>
<td>1 (Rayess)</td>
<td>Nov 10</td>
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<tr>
<td>SET: Marketing Plans, Competition and Strategic Alliances</td>
<td>1 (Rayess)</td>
<td>Nov 15</td>
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<tr>
<td>Project work</td>
<td>1 (Rayess)</td>
<td>Nov 17</td>
</tr>
<tr>
<td>SET: Operations and Financial Plans</td>
<td>1 (Rayess)</td>
<td>Nov 22</td>
</tr>
<tr>
<td>Project Work</td>
<td>3 (Rayess)</td>
<td>Nov 29 – Dec 6</td>
</tr>
<tr>
<td>SET: Dry run of presentation</td>
<td>1 (Rayess)</td>
<td>Dec 8</td>
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<tr>
<td>Final Presentation</td>
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<tr>
<td>Project deliverables due</td>
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**GRADING:**

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<tbody>
<tr>
<td>Attendance</td>
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<tr>
<td>Teamwork performance</td>
<td>10%</td>
</tr>
<tr>
<td>Milestone presentations</td>
<td>30%</td>
</tr>
<tr>
<td>Final presentation</td>
<td>25%</td>
</tr>
<tr>
<td>Project deliverables</td>
<td>25%</td>
</tr>
</tbody>
</table>

**EXAM SCHEDULE (TENTATIVE):** There are no exams. The final project presentations will be scheduled during the time normally targeted for final exams, which is Tuesday, December 13 from 11 AM to 12:50 PM.

**GRADING SCALE:**

- A 95-100, A- 90-94, B+ 85-89, B 80-84, B- 75-79, C+ 70-74, C 65-69, C- 60-64, D+ 55-59, D 50-54

**HOMEWORK POLICIES:** There will be no graded homework.

**IMPORTANT DATES:**

- September 12: Last Day to Drop a Course Without a "W"
- November 21: Last Day to Withdraw
- November 25-28: Thanksgiving recess

**ACADEMIC INTEGRITY:** Everything submitted for grading is expected to be a student’s own work. Anything suspected otherwise will be dealt with according to the College policy - see the Engineering Science Student Handbook.

**DISABILITY SUPPORT SERVICES AND ACCOMMODATIONS:** If you need course accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact Emilie Gallegos, Director of University Academic Services/Disability Support Services at gallegem@udmercy.edu or (313) 578-0310 to schedule an appointment. University Academic Services is located on the 3rd Floor of the Library on the McNichols Campus. Students with special needs are urged to identify themselves to the faculty to discuss their concerns.
However, faculty cannot provide disability accommodations without official notification from the Disability Support Services office.

MECHANICAL ENGINEERING UNDERGRADUATE PROGRAM OUTCOMES:
Graduates from the Bachelor of Mechanical Engineering program at the University of Detroit Mercy will have:

- an ability to apply knowledge of math, science and engineering principles to manufacturing, thermal systems, and mechanical engineering.
- an ability to design and conduct experiments, as well as to analyze and interpret data relating to thermal and mechanical systems.
- an ability to design thermal and mechanical systems, components or processes to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- an ability to function effectively on multi-disciplinary teams.
- an ability to identify, formulate, and solve mechanical engineering problems.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively.
- the broad education necessary to understand the impact of engineering decisions in a global, economic, environmental, and societal context.
- a recognition of the need for, and an ability to engage in life-long learning.
- a knowledge of contemporary issues related to the mechanical engineering profession.
- an ability to use techniques, skills, and modern engineering tools necessary for mechanical engineering practice.
- a general knowledge of chemistry and an in-depth knowledge of calculus based physics.
- the ability to apply advanced mathematics through multivariate calculus, differential equations, statistics and a familiarity with linear algebra.

MECHANICAL ENGINEERING UNDERGRADUATE PROGRAM EDUCATIONAL OBJECTIVES:
To produce engineers who understand the performance of engineered products and systems in terms of the relevant fundamental principles of math, science and the humanities, whether they are practicing engineers or students in graduate engineering programs.
To produce engineers who excel in the professional practice of mechanical engineering. Professional practice includes the ability to identify, design, and implement solutions to technical problems through a multiplicity of laboratory, analytical and communication methods within a business climate.
To produce engineers who are aware of how their roles as technical professionals and leaders affect the wider human community, who serve not only as employees or employers but as socially-conscious citizens, and who are motivated by moral principles in their professional and personal lives.
FALL 2013 Advanced Engineering Mathematics
ENG 5300
Vector Integral Calculus, Fourier Analysis, Separable Linear PDEs, and Complex Variables

shawasnm@udmercy.edu

Time: 18:40–19:55 Monday and Wednesday in Engineering 239

Office Hours: 11:00–12:00 Monday and Wednesday
or any mutually convenient time by appointment.


Exam Dates: First Exam: Wednesday October 9
Second Exam: Monday November 11

Grading: The final grade of the course is determined by the following percentages
In class exams: 45%
Computer assignments & HW: 15%
In class quizzes: 10%
Final Exam: 30%

The alphabetical grade is determined by the following schedule after
Rounding to the nearest tenth of percent
A  92%–100%  B-  80%–81.9%  D+  68%–69.9%
A-  90%–91.9%  C+  78%–79.9%  D  60%–67.9%
B+  88%–89.9%  C  72%–77.9%  F  0%–59.9%
B  82%–87.9%  C-  70%–71.9%

Important Dates: Last date to drop class without a “W”: September 2, 2013
Last day to withdraw with “W”: November 18, 2013
Computer Campus. Students with special needs are urged to identify themselves to the faculty to discuss their concerns. If you need special arrangements in case the building must be evacuated, please contact Emilie Gallegos, Director of Disability Support Services and Accommodations. Both Matlab and MAPLE are installed on PCs in computer labs. Matlab and MAPLE will be used.

Disability Support Services and Accommodations
If you need course accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact Emilie Gallegos, Director of University Academic Services/Disability Support Services at gallegem@udmercy.edu or (313) 578-0310 to schedule an appointment. University Academic Services is located on the 3rd Floor of the Library on the McNichols Campus. Students with special needs are urged to identify themselves to the faculty to discuss their concerns.

Syllabus

<table>
<thead>
<tr>
<th>Week of</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 26</td>
<td>§9.1-9.3, §9.4-9.5</td>
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<tr>
<td>September 2</td>
<td>☐, §9.6-9.7</td>
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<td>September 9</td>
<td>§9.8-9.9, §10.1-10.2</td>
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<td>September 16</td>
<td>§10.3-10.4, §10.5-10.6</td>
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<td>September 23</td>
<td>§10.7-10.8, §10.9-11.1</td>
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<td>September 30</td>
<td>§11.2-11.3, §11.4-11.5</td>
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<tr>
<td>October 7</td>
<td>§11.6-11.7, First Exam</td>
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<tr>
<td>October 14</td>
<td>☛ + ☛, §11.8-11.9</td>
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<tr>
<td>October 21</td>
<td>§12.1-12.3, §12.3-12.4</td>
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<td>October 28</td>
<td>§12.5-12.6, §12.7</td>
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<td>November 4</td>
<td>§12.8, §12.9</td>
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<td>November 11</td>
<td>Second Exam, §12.10-12.11</td>
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<tr>
<td>November 25</td>
<td>§13.6-13.7, Turkey day</td>
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<tr>
<td>December 2</td>
<td>§14.1-14.2, §14.3-14.4</td>
</tr>
<tr>
<td>December 16</td>
<td>Final 19:30-21:20 in E239</td>
</tr>
</tbody>
</table>

Problems numbers with * require using Matlab. The code below, answers problem 8h in §9.4, modify it to answer related problems.

```matlab
[x y]=meshgrid(-1:0.1:1,-1:0.1:1); z=x.^2-2*x-y.^2; contour3(x,y,z,57); hold on; [px,py] = gradient(z,0.2,0.15); quiver(x,y,px,py); axis image;
```

Problems numbers with * require using Matlab. The code below, answers problem 8h in §9.4, modify it to answer related problems.

```matlab
[x y]=meshgrid(-1:0.1:1,-1:0.1:1); z=x.^2-2*x-y.^2; contour3(x,y,z,57); hold on; [px,py] = gradient(z,0.2,0.15); quiver(x,y,px,py); axis image;
```
However, faculty cannot provide disability accommodations without official notification from the Disability Support Services office. 

UNIVERSITY ACADEMIC SERVICES IS LOCATED ON THE 3RD FLOOR OF THE LIBRARY. OUR MAIN OFFICE NUMBER IS (313) 993-1143
Text: Silent Spring, by Rachel Carson  
The Fluoride Deception  
Cradle to Cradle  
Other notes, articles, etc., as assigned.

Objectives: To introduce students to the rather large world of the chemical literature, and how chemical issues affect society. An emphasis is placed on ethical decision making in industrial and other situations where the science and society interact.

This is an upper level class. A significant amount of student interaction will be involved as it progresses, sometimes in the form of small group work in class. As well, the division of assigned papers will try to follow the new NSF Division of Chemistry thrusts, listed below:

- Chemical Catalysis  
- Chemical Measurement and Imaging  
- Chemical Structure, Dynamics and Mechanisms  
- Chemical Synthesis  
- Chemistry of Life Processes  
- Environmental Chemical Sciences  
- Macromolecular, Supramolecular and Nanochemistry  
- Theory, Models and Computational Methods

Tentative Lecture Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapter / Material Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 August 2013</td>
<td>Introduction, first discussion, topic selection.</td>
</tr>
<tr>
<td>28 August 2013</td>
<td>Subject: The Atlantic, “We Will Never Run Out of Oil”</td>
</tr>
<tr>
<td>4 September 2013</td>
<td>Subject Matter: __________________</td>
</tr>
<tr>
<td>9, 11 September 2013</td>
<td>out of class assignment, Silent Spring</td>
</tr>
<tr>
<td>16 September 2013</td>
<td>Quiz on Silent Spring, and Subject matter: __________________</td>
</tr>
<tr>
<td>18 September 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>23 September 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>25 September 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>30 September 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>2 October 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>7 October 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>9 October 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
<tr>
<td>14 October 2013</td>
<td>no class, UDM fall break</td>
</tr>
<tr>
<td>16 October 2013</td>
<td>Subject matter: __________________________________________</td>
</tr>
</tbody>
</table>
21 October 2013  Subject matter: _________________________________________
23 October 2013  Subject matter: _________________________________________
28 October 2013  Subject matter: _________________________________________
30 October 2013  Subject matter: _________________________________________
4 November 2013  Subject matter: _________________________________________
6 November 2013  Subject matter: _________________________________________
11 November 2013 Subject matter: _________________________________________
13 November 2013 Subject matter: _________________________________________
18 November 2013 Subject matter: _________________________________________
20 November 2013 Subject matter: _________________________________________
27 November 2013 no class, UDM Thanksgiving
2 December 2013  Subject matter: _________________________________________
4 December 2013  Subject matter: _________________________________________
9 December 2013  Subject matter: _________________________________________

Grading and grade scale: The following will be utilized to determine course grades:

<table>
<thead>
<tr>
<th></th>
<th>CHM4380</th>
<th>CHM5380</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes (Q)</td>
<td>10 points each</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>100 pts</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>Q pts</td>
<td>Q+100 pts</td>
</tr>
</tbody>
</table>

When all is said and done, the class average is essentially a B.

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course (please refer to the UDM Catalog and E&S Handbook for any explanations). At this point in your academic careers, I really don’t expect you to cheat. If you do, the 0 for the assignment generally brings you way down for the course. So, for Pete’s sake, don’t try it.

Class Participation: This class truly depends on students being part of the discussion. Anyone who simply sits in class, takes notes, but never speaks, will end up with no higher than a B, no matter how good their quizzes and final exam grades are. The more intelligent comments a person makes in these discussions, the more lenient Dr. B will be overall. This is intended to take the place of the usual nauseating, pre-graduation whining, sniveling, pleading, and abject groveling that Dr. B usually has to put up with.

Topics suggested by the class, 26 August 2013:
Pesticide production, use, end results
Medical meshes, how they are made
Plastics, both pollution and advances
Recyclable materials in cars
Pet coke
Drug composition – what’s actually in a pill?
Instrument advances
Chemical riot control
Composition of fireworks and explosives
Hg/Pb in dog treats and toys
Chemicals in fast food production
MRE materials
Vaccine production
Food and clothing dyes
Tattoo inks
Leaded body jewelry
Bullion coins and how they are produced
USP methods
Trace analysis in hair etc.
Text: Notes, articles, etc., as assigned.

Objectives: The course will survey the growing field of alternative and sustainable energy, with an emphasis on sources. It will look at the different ways in which energy is generated, and the chemistry involved in each process. The topic of alternative fuel chemistry will include processes that are established, but that still have growth potential, as well as processes that are still in their earliest stages. The course will culminate with student presentations on specific aspects of alternative energy sources, and the chemistry that enables such sources.

Tentative Lecture Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Material Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 August – 4 December, Thursday evening, excluding Thanksgiving.</td>
<td></td>
</tr>
<tr>
<td>1. Introduction, traditional and renewable fuels</td>
<td></td>
</tr>
<tr>
<td>2. Fuels and energy needs.</td>
<td></td>
</tr>
<tr>
<td>3. Energy for power grids.</td>
<td></td>
</tr>
<tr>
<td>4. Fuels for transportation.</td>
<td></td>
</tr>
<tr>
<td>5. Hybrid vehicles.</td>
<td></td>
</tr>
<tr>
<td>7. A hydrogen economy</td>
<td></td>
</tr>
<tr>
<td>8. Solar energy</td>
<td></td>
</tr>
<tr>
<td>9. Wind energy</td>
<td></td>
</tr>
<tr>
<td>10. Geothermal energy</td>
<td></td>
</tr>
<tr>
<td>11. Wave energy.</td>
<td></td>
</tr>
<tr>
<td>12. Pollution</td>
<td></td>
</tr>
</tbody>
</table>

Final two weeks - student presentations, 30 minutes each.

Note: Read the subject material before attending class, as there is a short quiz at the beginning of each class. It really helps!

Grading and grade scale: The following will be utilized to determine course grades.

<table>
<thead>
<tr>
<th>Quizzes 1 – 12</th>
<th>15pts each (15pt x 10)</th>
<th>150 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td></td>
<td>100 pts</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>250 pts</td>
</tr>
</tbody>
</table>

Academic Integrity: Students are expected to conform to a high standard of honesty and integrity in this course (please refer to the UDM Catalog and E&S Handbook for any explanations). At this point in your academic careers, I really don’t expect you to cheat. If you
do, the 0 for the assignment generally brings you down to an F for the course. So, please, don’t try it.

Additional Papers: Literature papers will be given out as the occasion warrants. Those papers will often be the basis of test questions. But we will also discuss them in the class after they have been handed out. The more intelligent comments a person makes in these discussions, the more lenient Dr. B will be with that person’s test and final grades. This is intended to take the place of the usual nauseating, pre-graduation whining, sniveling, pleading, and abject groveling that Dr. B usually has to put up with.

Presentation Tips:
1. Have a topic by 19 September.
2. Turn in references by 3 October.
3. Format can be anything you’d like, but think in terms of 30 power point slides, so that your talk is about 30 minutes long.
4. Have proper references for the talk – not just one, with the talk being a re-hash of the sources. Ten sources is about right.
5. The other students will be given a grade sheet for your talk. They will fill it out, and turn it in to Dr. B., who will use it in determining the grade for the talk.
University of Detroit Mercy     Department of Chemistry and Biochemistry     Term II, 2012-13

CIM 5020: Chemical Information and Safety

Instructor: Elizabeth Roberts-Kirchhoff, Ph.D
Office: Chemistry Rm 109
Telephone: 313-993-1021
Email: robkires@udmercy.edu
Office Hours: Mon and Wcd 2-4 PM or by appointment

Course Description:
This course is both an introduction to current methods of chemical information retrieval and an introduction to safety procedures and OSHA requirements for the handling, storage, and disposal of chemicals.

Course materials:
Safety in Academic Chemistry Laboratories: Accident Prevention for College and University Students, Vol 1, 7th Ed. (The department will provide this to you.)
The ACS Style Guide: Effective Communication of Scientific Information 3rd Ed., Coghill, A.M., Garson, L.R. Eds.; Oxford University Press, 2006. (Available in the reference section of the library—you only need to have access to this.)

Course website: knowledge.udmercy.edu.

Course Objectives:
Access and use the chemical literature
Discuss ethics in publication and research practices
Examine proper chemical hygiene and safety standards within a laboratory setting

Units: These will be available for approximately 2 weeks each. See the course webpage for when each unit will be available.

1. Laboratory Safety Training
   a. On-line PowerPoint presentation
   b. Assignment (35 pts)
   c. Quiz (40 pts)

2. Chemical Labels
   a. On-line PowerPoint presentation
   b. Assignment (35 pts)
   c. Quiz (40 pts)

3. Chemical hazardous waste
   a. On-line PowerPoint presentation
   b. Assignment (35 pts)
   c. Quiz (40 pts)
4. Library searching of scientific literature.
   a. Instruction by librarian (5 pts)
   b. Assignment (30 pts)

5. Ethics in publication and research practices
   a. Assigned readings
   b. Assignment (30 pts)
   c. Discussion (10 pts)

Course Structure:
This course will involve two meetings of the instructor with the entire class; one meeting
of the class with the science librarian; and five online, self-paced units. The initial meeting
with the instructor will be an orientation meeting to hand out the syllabus and cover the course
structure. The time and date of the meeting with the librarian will be discussed at the first course
meeting. The final meeting will occur in the 10th or 11th week of the semester. This will involve a
discussion of the course and a discussion of ethics in publication and research. The self-paced
units must be completed before this meeting. The assignments are submitted online and the
quizzes are completed online.

Grading:
Total available points: 300. Grades will be based on the following:
   260-300 points A
   210-259 points B
   180-209 points C
   Below 179 points F

Important Dates:
   January 11 Last day to drop without a “W”
   February 26 Midterm grades due from faculty
   March 28 Last day to withdraw from class

Academic Integrity:
Students are expected to conform to a high standard of honesty and integrity in this
course. Please refer to the University Catalog and E&S student handbook for a further
explanation of academic integrity. Everything submitted for grading (exams, problem sets, etc.)
is expected to be a student’s own work. Anything suspected otherwise will be dealt with
according to University and E&S policies.

The Department of Chemistry and Biochemistry has a cellular phone/pager policy. These
units should be turned off prior to coming to class and usage of a cell phone, for calls other than
emergencies, during class is prohibited. Students using a cell phone will be asked to leave for
that day. Using a cellular phone/pager/PDA during an in class quiz or exam will result in a “0”
for that quiz or exam. Please note that this includes making or answering phone calls or using the
calculator functions of these devices during a quiz or exam.
CIVE 5890: Earth Retaining Systems & Slope Stability
(Elective)

Course Catalog Description:
Lateral earth pressure. Analysis and design of cantilever retaining walls, cantilever sheetpile walls, anchored walls, and braced excavations. Stability of slopes. 3 cr

Prequisite: CE348 Soil Mechanics / CIVE 3480: Geotechnical Engineering

Corequisite: None

Course Instructor: James Lynch
Department: Civil Engineering

Contact Information: Phone number: (313) 993-3361
Email address: lynchjj@udmercy.edu

Office Hours: 10:00 to 12:00 MW 2:00 to 5:00 F, or by appointment

Class hours: 6:00 to 7:21 pm TTh, Room E210

Required Text: None. Handouts will be provided.

Course Outcomes:

Upon the successful completion of this course, students will be able to:
1. Use the principles of shear strength testing using direct shear, triaxial, and unconfined compression methods to understand stress-strain-strength behavior of sands and clays under drained and undrained conditions (program outcome a)
2. Apply Mohr-Coulomb failure criterion to solve for shear strength parameters of sands and clays (program outcome a)
3. Compute the lateral earth pressure for various soil-structure interactions
4. Design earth retaining systems of steel and reinforced concrete (program outcome a)
5. Design tied-back anchors (program outcome a)
6. Compute the movements of earth retaining systems in service (program outcome a)
7. Evaluate construction practices (program outcomes a)
8. Determine the factor of safety against slope failures (program outcome a)
9. Other topics based on interest of class and instructor
**Submittals**
Homework assignments will be a combination of “pencil and paper” and computer formats. The due date of each assignment will be posted on the assignment. Homework problems will be worth between 5 and 25 points each, depending on the length and complexity of the individual problems.
The class will include one midterm exam and one final exam.

**Academic Integrity**
Everything submitted for grading is expected to be a student’s own work. Anything suspected otherwise will be dealt with according to the College policy – see the Engineering and Science Student Handbook.

**Grading**
Homework: 20%
Project 20%
Midterm 25%
Final examination 35%
Grading Scale:
A: 90% to 100%
B: 80% to 90%
C: 70% to 80%
D: 60% to 70%
F: Less than 60%

**Prepared by:** James Lynch

**Date of Preparation:** May 6, 2013
CE 548: Advanced Soil Mechanics

Course Catalog Description: 3 cr

Prequisite: CE348 Soil Mechanics

Corequisite: None

Course Instructor: James Lynch  Department: Civil Engineering

Contact Information:

Phone number: (313) 993-3361
Email address: lynchjj@udmercy.edu

Office Hours: by appointment

Class hours: To be determined


Course Outcomes:

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

1. Analyze states of stress or strain for plane stress, plane strain, and three-dimensional conditions.
3. Compute the settlement of structures for various load geometries and soil profiles.
5. Analyze field and laboratory test results to determine stress-strain-strength parameters for soil.
6. Determine the SHANSEP parameters of soil.
7. Compare the results of strength and settlement values predicted by analytical, numerical, and empirical methods to values measured in the field.
Submittals

Homework assignments will be a combination of “pencil and paper” and computer formats. The due date of each assignment will be posted on the assignment. Each homework assignment will be worth 100 points and the point value of individual problems will vary based on its length and complexity.

The class will include one midterm exam and one final exam.

Academic Integrity

Everything submitted for grading is expected to be a student’s own work. Anything suspected otherwise will be dealt with according to the College policy – see the Engineering and Science Student Handbook.

Grading
Homework  30%
Individual project  10%
Group project  10%
Midterm examination  20%
Final examination  30%

Grading Scale:
A: 90% to 100%
B: 80% to 90%
C: 70% to 80%
D: 60% to 70%
F: Less than 60%

Prepared by: James Lynch

Date of Preparation: February 22, 2009