

New Jersey City University and HR College of Mumbai

New Course Proposal

1. Course ID: ES 440

2. Full Course Title: Global Needs of Water Harvesting

3. Credits: This is a three-credit course which fulfills the writing proficiency requirement.
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4. Course Components:

This three-credit blended course is a partial hybrid 80% online 20% in class meeting.

5. Course Level: 400

6. Course Description: This course offers problem solving activities that stimulate the inclusive educational challenges of concepts learning through practice and theory. Utilizing skills across curriculum to facilitate a global perspective to support environmental change.

7. Course Prerequisite: Intermediate Algebra

8. Rationale:

This 3 credit course is designed as an upper level course within the Pre-Engineering Department to fulfill the necessary requirements towards the obtainment of the qualifications for a bachelor's degree. The Pre-Engineering degree program prepares students to pursue further studies in various fields of engineering. As a field of study with a global perspective, engineering students taking this course will pursue learning opportunities designed to connect the skills and theory learned in earlier courses to real world problems through participation in project-based learning activities and assessment cumulating in an onsite week long practicum experience. The course's blended experience will support the international partnership offered by NJCU and the H R College of Mumbai.

9. Learning Outcomes:

Upon completion of this course the successful student will be able to:	Assessment of these outcomes:
Develop a comprehensive understanding of the significant role of water collection and sustainability in a global perspective.	Weekly writing assignments, lab reports and discussion including research of varied situations around the globe.
Use mathematical, scientific and physical applications to determine best practices in water collection and sustainability.	Using the Engineering Design Process to research, plan, construct and reconstruct as reflected in logs and journals.
Construct models of various structures and systems to collect, purify and maintain water effectively in varied environments..	Project-based assessment including, peer reviewed research papers, journals, logs and reflections using the Engineering Design Process (EDP) during construction phases.

Learning Outcomes which integrate University Wide Student Learning Goals

Students will demonstrate effective writing skills as demonstrated by writing research papers, responding to weekly discussion board topics and keeping accurate journals and logs. Students will demonstrate effective quantitative literacy skills through the application of mathematical computation and analysis during real life experiences and experiments.

10. Instructional Procedures:

The students will demonstrate the comprehension of outcome #1 through weekly writing assignments, lab reports, discussions, research and lectures.

The students will be assessed on outcomes #2 through research, journals, logs, weekly writing assignments, class discussion and small group work.

The students will meet the target assessment of learner outcome #3 through project based assessments including journals, logs, weekly writing assignments and lectures and research.

11. Course Content:

Week	Topic	Method
1	The Global Needs of Water Harvesting a) Resources b) Population growth c) Methods d) Future demands	Lecture, PowerPoint Discussion board topic
2	The Engineering Design Process (EDP) a) Identify the need and constraints b) Research the problem c) Develop possible solutions d) Plan and select a promising solution e) Build a prototype f) Test and evaluate prototype g) Improve; Redesign as needed	Small Group Mini Projects Conduct research Discussion board topic
3-4	Blackboard lecture on theory of Project Management: Discussion Board posting topic: As this course and any possible projects developed during it are based on an international component, utilize a global perspective to explain the issues of project management from a distance.	Research Paper Discussion board topic
5	Surface Area and Volume Applications a) Connect surface area to volume b) Calculate volumes of different shapes	Hands-On Discussion board topic
6	Trigonometric Applications a) Angle of elevation and depression b) Discussion of roof pitch relative to angle of rainfall	Lecture Discussion board topic
7	Real-World Problem-Solving Applications a) Average rainfall b) Population density and rainfall	Lecture, Hands-On

	c) Water runoff (ground vs. pavement)	Discussion board topic Journals Logs Reflection
8	Water Harvesting and Filtering a) Environment b) Sources of collection c) Filtration methods	Lecture, PowerPoint Discussion board topic
9	Water Storage and Maintenance a) Urban areas b) Rural areas	Lecture, PowerPoint Discussion board topic
10	The Water Cycle Part 1-State Changes/Water Storage from Oceans to Atmosphere a) Condensation b) Evaporation c) Evapotranspiration d) Volumes e) Size and speed of rain	Lab, Hands-On Discussion board topic Journal Log
11	The Water Cycle Part 2- Water Storage in Ice and Snow/Movement a) Snowmelt b) Streamflow c) Groundwater	PowerPoint, Hands-On Discussion board topic
12	The Water Around Us a) Shapes and sizes of raindrops b) Water functions in the human body c) Why the ocean is salty d) Ratios/volumes	Lecture, PowerPoint Discussion Board topic

13	Physical Water Properties Part 1 a) Adhesion/Cohesion b) Capillary action c) Color d) Compression, density and weight e) Heat capacity	Lab, Hands-On Discussion Board topic
14	Physical Water Properties Part 2 a) Surface tension b) Temperature c) Turbidity d) Vapor pressure e) The universal solvent	Lab, Hands-On Discussion Board topic
15	Chemical Water Properties a) Conductivity b) Dissolved oxygen c) Hardness d) pH and salinity	Lab, Discussion board topic
16	Final Project: Cumulative cooperative project incorporating all aspects of course content in substantial real world application.	On-site Group collaboration report, Discussion board reflection

13. **Undergraduate Upper level course**

14. **This course is part of the Pre- Engineering Department**

16. **Assessment Component:**

Assessment	Description	Points	Duration
Research	<p>Research three geographic locations around the world varying in socioeconomic status, urban or rural, population density etc. that are in need of water collection. Determine what assets are available to collect water. Will it be above ground storage or below ground? What type of storage facility will be used? How densely populated is the area? How can the water be purified and maintained?</p> <p>Write a 3-5 page research report in APA format addressing each of the subtopics listed above.</p>	5	1 week
Project 1	<p>Rain Cloud: Create a rain cloud out of Plexiglas or use a clear plastic bin that will evenly distribute 3 inches of rain over an area of approximately 350 square inches over a period of ten minutes. Create a catch basin to collect the water.</p> <p>After successful completion of the rain cloud, fill the rain cloud to the height of 3 inches and log the height of the water in the cloud after each minute.</p> <p>Submit a written document including log results, analysis and reflection.</p>	10	2 weeks
Project Management	<ul style="list-style-type: none"> Theory of Project Management 	15	2 weeks

	<ul style="list-style-type: none"> ● Write a 4-6 page research article review including three peer-reviewed articles written within the last five years in APA format. ● Discussion of research (need for water harvesting) ● Mathematics applications 		
Project 2	<p>Water Collection: Above Ground Model:</p> <p>Use the Engineering Design Process to create a roof that will collect water and lead it to a storage system from the water under your “rain cloud”. Collect the water in one or multiple storage tanks depending on the environmental setting. What percent of the volume was collected? How can you increase the collection? Keep a log of your experiments. Add a purification system to your model.</p> <p>Write a description on the flow of the system to be submitted with the log of your experiment results.</p>	20	6 weeks
Project 3	<p>Water Collection Proposal:</p> <p>Find a building on campus to theoretically collect water. Determine the yearly average rainfall and how much water can be collected, purified, stored and used for the building. Determine how the water is going to be used (waste, drinking etc.). Determine the location of storage and design the purification system.</p>	20	4 weeks

	Submit drawings of your plans from multiple angles and written documentation of the predictions with reflection.		
Weekly Discussion Board Topics	Submit a written response to the Discussion Board topic posted each week. Read at least 90% of the threads posted and respond to at least two peers weekly.	10	15 weeks
Final Project	Water Science/Onsite application of group projects/ Group Collaboration Report.	20	1 week

17. Required Text:

Chin, D. (2014). *Water-resources engineering* (3rd ed.). Upper Saddle River, N.J.: Pearson Education.

(Available at NJCU bookstore or click link below for purchase options on Amazon.com :

http://www.amazon.com/gp/product/0132833212/ref=pd_lpo_sbs_dp_ss_2?pf_rd_p=1944687682&pf_rd_s=lpo-top-stripe-1&pf_rd_t=201&pf_rd_i=0470460644&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=0PE00EQ322BRK2KYRNX3

Supporting Bibliography:

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