

K O W A N C O L L E G E
C U R R I C U L U M C O M M I T T E E

R

PROPOSAL TITLE: GROUNDWATER AND SOIL REMEDIATION FOR SENIORS C408-432

UNDERGRADUATE GRADUATE # 3 CREDIT HOURS

SPONSOR(S): DR. RALPH ALAN DUSSEAU, P.E. and THE SCHOOL OF ENGINEERING CURRICULUM COMMITTEE

DEPARTMENT & TELEPHONE# CIVIL ENGINEERING Ext. 4628

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION
 ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

<p style="text-align: center;">STEP #1 (DEPARTMENT)</p> <p><input checked="" type="checkbox"/> APPROVED/DATE: <u>9/23/96</u></p> <p>NOT APPROVED/DATE:</p> <p style="text-align: center;"><i>Ralph Alan Dusseau</i></p> <p style="text-align: center;">DEPT. CURRICULUM CHR. Ralph Alan Dusseau</p> <p><input checked="" type="checkbox"/> REVIEWED/DATE: <u>9/23/96</u></p> <p style="text-align: center;"><i>Ralph Alan Dusseau</i></p> <p style="text-align: center;">lph Alan Dusseau DEPT. CHR.</p>	<p style="text-align: center;">STEP #2 (RECEIPT)</p> <p>SCC# <u>96-97-53</u></p> <p>DATE RECEIVED:</p> <p style="text-align: center;"><i>Ronald J. Gibson</i></p> <p style="text-align: center;">SENATE CURRICULUM CHR.</p>	<p style="text-align: center;">STEP #3 (SCHOOL)</p> <p>REVIEWED DATE:- <u>9/27/96</u></p> <p><input checked="" type="checkbox"/> RECOMMEND TO APPROVE</p> <p><input type="checkbox"/> RECOMMEND NOT TO APPROVE</p> <p style="text-align: center;">FORWARD FOR OPEN HEARING</p> <p><input checked="" type="checkbox"/> WITHOUT RESERVATIONS</p> <p><input type="checkbox"/> WITH RESERVATIONS</p> <p>COMMENTS:</p> <p style="text-align: center;"><i>Ronald J. Gibson</i></p> <p style="text-align: center;">SCHOOL COMMITTEE CHR.</p>
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<p>STEP #4 (ACADEMIC DEAN)</p> <p><input checked="" type="checkbox"/> RECOMMEND</p> <p><input type="checkbox"/> NOT RECOMMEND</p> <p><input type="checkbox"/> CONDITIONALLY RECOMMEND (SEE COMMENTS)</p> <p>DATE & SIGNATURE, DEAN OF SCHOOL</p>	<p>COMMENTS:</p> <p style="text-align: center;"><i>J. Stacey</i></p> <p style="text-align: right;">9/27/96</p>
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<p>STEP #5 (SENATE CURRICULUM COMMITTEE)</p> <p>DATE OF OPEN HEARING <u>3-5-97</u></p> <p>APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) <u>3/5/97</u></p> <p><input type="checkbox"/> RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:</p> <p>_____</p> <p>_____</p>
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<p>STEP #6 (SENATE)</p> <p>DATE PRESENTED TO SENATE <u>3/6</u></p> <p>NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST, (DATE) _____</p> <p>SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE</p>	<p><input checked="" type="checkbox"/> APPROVED <input type="checkbox"/> NOT APPROVED</p> <p style="text-align: center;"><i>Ronald J. Gibson</i></p>
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STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED May 27 1997

APPROVED: YES NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 1

FACULTY LOAD HOURS 1

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 7 June 97

REGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0908-432

DATE/SIGNATURE OF REGISTRAR B. J. Keating

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSON(S)

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

Course Proposal:

1. Details:

- a) Course Title: Groundwater and Soil Remediation for Seniors
- b) Sponsor: Dr. Ralph Alan Dusseau and the School of Engineering Curriculum Committee
- c) Credit Hours: 3 credit hours
- d) Course Level: Seniors (0908.432)
- e) Curricular Effect: Elective course for civil engineering students in the environmental emphasis
- f) Prerequisites: Fluid Mechanics I, Organic Chemistry I
- g) Suggested Times/
Scale of Implementation: One section every other fall semester
- h) Resources:

Faculty: Existing faculty will teach this course.

Library: Library acquisitions will be required.

Equipment: Laboratory space and appropriate experimental equipment for groundwater analysis, treatment, and design will be required.

Computers: Computer laboratory space and appropriate environmental engineering analysis and design software will be required.

2. Rationale:

The proposed course is the revised version of a course entitled "Advanced Solid Waste Management" which was part of the Engineering Curriculum that was approved by the College Senate in December 1994. The proposed course is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February 1995.

The fundamental theme of the course is study of advanced topics in treatment of contaminated groundwater and soils. Fate and transport mechanism of contaminants will be explored through use of numerical models.

3. Essence of the Course:

a) Objectives:

Upon completion of the course, civil engineering students will be able to do the following:

Understand and apply groundwater and soil remediation technology

Understand and apply the fundamental principles of groundwater flow, soil properties, fate and transport of contaminants

b) Topical Outline:

The instructor will supply the students with a syllabus during the first week of classes. The instructor will assess any engineering technology advances and make necessary topic changes as deemed appropriate to maintain the standards of the course. The topics to be covered are listed below:

Introduction to Groundwater Flow:
Fundamental Physics of Fluid flow
Darcy's law
Hydraulic Conductivity
Flow through Porous Media
Saturated and Unsaturated Flow
Richard's Equation
One-dimensional Infiltration
Flows of Immiscible Fluids

Well Hydraulics

Introduction to Soil Properties:
Types of Soil, Classification Types, Characteristics
Migration of Water and Hydrocarbons in Soil
Element Adsorption and Mobility in Soil
Chemical Reaction in Soils

Fate and Transport of Contaminants:
Adsorption
Diffusion

Dispersion
Volatilization
Biodegradation
Natural Attenuation

Remedial Technologies

Groundwater:

Air Sparging
Vacuum Vapor Extraction
Free product Recovery
Air Stripping
Carbon Adsorption
UV Oxidation
Dual Phase Extraction
Biofiltration
Co-metabolism
Slurry Walls
Nutrient and Oxygen Enhancement

Soils:

In Situ Biodegradation
Soil Vapor Extraction
Bioventing
Soil Flushing
Land Farming
In Situ Vittrification
Incineration
Pyrolysis
Excavation and Off-Site Disposal

Mathematical Modeling:

c) Evaluation and Grading Procedure of Students:

Student grades will be based on team problems, team projects, team lab reports, individual examinations, and individual homework.

d) Course Evaluation:

The proposed course will be evaluated based on student evaluations and curriculum review by engineering faculty.

4. Results of Consultations:

The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994.

Consultations were submitted with the original proposal as specified by the Curriculum Committee.

Additional consultations were sought from the Biological Sciences Department and the Department of Chemistry and Physics. A letter of consultation was received from the Biological Sciences Department.

Catalog Description:

Groundwater and Soil Remediation for Seniors (0908.432)

(Prerequisites: Fluid Mechanics I, Organic Chemistry I)

The course deals with remedial technologies available for contaminated groundwater and soils. The course explores the fundamental physics of fluid flow and contaminant transport through porous media. The course includes appropriate laboratory experiments and computer applications.

ROWAN

Biological Sciences Department

(609) 256-4833

Fax: (609) 256-4921

*TO: Dr. R. A. Dusseau, Chairperson
Environmental Engineering*

FROM: Biological Sciences Department

RE: Environmental Engineering Course Proposal

DATE: November 15, 1996

The Biological Sciences Department in its review of the six course proposals for the Environmental Engineering program, offers the following comments or concerns.

The department supports all six proposals, however most of these courses have a strong biological component, therefore we believe students should have Biology I and Microbiology as prerequisites.

Also we believe the engineering courses must be team-taught and that the biology component taught by a member of the Biology Department. The environmental field is an interdisciplinary one, and our department has the experts to integrate with engineering in this particular area. We would like to see a more active participation between the two departments.

*All of these courses could be beneficial to Biology majors in the Ecology/
Environmental track. The graduate courses in Environmental Engineering would be especially appealing to students when the Biological Sciences Department develop the Master Program in Environmental Sciences. Therefore, we propose that these courses be taken with "or approval of instructor."*

cc: P. Bartelt